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ABSTRACT

This document provides lists of tasks, performance objectives, and enabling objectives for 1,800 hours of postsecondary instruction or 900 hours of secondary instruction in the drafting and design technology program. Following a list of tasks and an explanation of the program, the bulk of the document consists of 25 modules, each of which is a list of tasks and the performance objectives and enabling objectives that pertain to each task. The titles of modules, considered duty areas, are as follows: (1) demonstrate employability skills and habits; (2) demonstrate knowledge of program; (3) apply basic drafting skills; (4) solve technical mathematical problems; (5) prepare multiview drawings; (6) prepare sectional views; (7) prepare auxiliary drawings; (8) apply basic dimensioning; (9) prepare pictorial drawings; (10) prepare sheet metal developments; (11) utilize drafting applications; (12) prepare basic charts and graphs; (13) perform basic computer skills; (14) prepare basic computer-aided drawings; (15) prepare basic architectural drawings; (16) prepare basic structural drawings; (17) prepare basic civil drawings; (18) prepare basic electrical/electronic drawings; (19) prepare basic pneumatic/hydraulic drawings; (20) prepare basic mechanical drawings; (21) prepare advanced electronic/electrical drawings; (22) prepare advanced computer-aided drawings; (23) prepare advanced mechanical drawings; (24) prepare tool and die drawings; and (25) apply basic surveying skills. (CML)

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Vo. Ed. #210

Curriculum Guide for *DRAFTING AND DESIGN TECHNOLOGY*

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VOCATIONAL TECHNICAL EDUCATION

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DRAFTING AND DESIGN TECHNOLOGY

March, 1992
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State of Idaho
DIVISION OF VOCATIONAL EDUCATION

650 WEST STATE STREET BOISE, IDAHO 83720-3650 (208) 334-3216 FAX (208) 334-2365

March 4, 1992

Greetings:

The Division of Vocational Education is pleased to provide you with this State Curriculum Guide as a part of our commitment to your efforts in conducting quality educational programs for students who are preparing for employment in meaningful and rewarding occupations.

We know that a great deal of time and effort goes into the operation of a Vocational Education program, and we applaud your local efforts to make these programs available for students. This State Guide should assist you in these efforts.

The competency-based State Guide was developed from a Technical Committee Report prepared with the assistance of industry personnel. The Report includes a Task List which is the basis for the State Guide. The Tasks identified in the Technical Committee Report were representative of the competencies needed by a worker to be hired or employed in Idaho businesses.

Vocational Education has adopted the Competency-Based approach as the primary method of delivering Vocational Education skills to students. Competency Profiles are available for each student enrolled in programs as a means of recording student progress. The Profile is used as a student record when additional training is sought -- aiding in the program articulation process. The Profile also communicates to employers those skills the student has mastered.

We hope you find this document useful. Your comments are welcome!

Trudy Anderson, Ph.D.
Administrator

Equal Opportunity Employer

TABLE OF CONTENTS

Introduction v

Acknowledgements vi

TASK LIST vii

CURRICULUM FRAMEWORK 1

MODULE I - Demonstrate Employability Skills and Habits 10

MODULE II - Demonstrate Knowledge of Program 16

MODULE III - Apply Basic Drafting Skills 20

MODULE IV - Solve Technical Mathematical Problems 30

MODULE V - Prepare Multi-View Drawings 34

MODULE VI - Prepare Sectional Views 38

MODULE VII - Prepare Auxiliary Drawings 42

MODULE VIII - Apply Basic Dimensioning 46

MODULE IX - Prepare Pictorial Drawings 50

MODULE X - Prepare Sheet Metal Developments 54

MODULE XI - Utilize Drafting Applications 57

MODULE XII - Prepare Basic Charts And Graphs 61

MODULE XIII - Perform Basic Computer Skills 64

MODULE XIV - Prepare Basic Computer Aided Drawings 69

MODULE XV - Prepare Basic Architectural Drawings 74

MODULE XVI - Prepare Basic Structural Drawings 82

MODULE XVII - Prepare Basic Civil Drawings 87

MODULE XVIII - Prepare Basic Electrical/Electronic Drawings 92

MODULE XIX - Prepare Basic Pneumatic/Hydraulic Drawings 96

TABLE OF CONTENTS - Continued

MODULE XX - Prepare Basic Mechanical Drawings 101

MODULE XXI - Prepare Advanced Electrical/Electronic Drawings 108

MODULE XXII - Prepare Advanced Computer Aided Drawings 113

MODULE XXIII - Prepare Advanced Mechanical Drawings 120

MODULE XXIV - Prepare Tool and Die Drawings 126

MODULE XXV - Apply Basic Surveying Skills 129

INTRODUCTION

The curriculum development process undertaken by the Idaho Division of Vocational Education involves the active use of industry personnel. Industry personnel comprise the sole membership on Technical Committees which are responsible for the development of Task Lists for each program. A Technical Committee Report is prepared on completion of the Committee's assignment. This publication is the Technical Committee Report.

The Task List prepared in the Technical Committee Report reflect the current trends and skills necessary for an employee to: 1) Obtain a job in Idaho's industry, 2) retain a job once hired, and, 3) to advance in the occupational field. Task Lists are grouped according to Duty areas generally used in industry settings. Duty areas are used as the basis for modules in the Statewide Curriculum Guide development process. The Technical Committee segment is the single most significant step in the curriculum development process. All future curriculum activities are predicated on the premise that an accurate picture of industry needs are reflected in the Task List.

Instructional personnel are selected to develop the Statewide Curriculum Guide. These instructors write Performance Objectives for each Task and the subsequent Enabling Objectives for each Performance Objective. The committee members prepare all material in a competency-based format so as to have an effective and efficient methodology for determining student progress. The Statewide Guides are designed as the prime determiner of program content. All programs must follow the established Guide in order to be approved for operation. Any deviation from this Guide requires written approval from the respective program supervisor at the Division of Vocational Education. It is not the intent of the Division that all programs be designed to be exactly the same, but assurance is needed to ensure that the program meets the minimum standards for operation, based on the community needs, equipment, and facilities available to the local school or institution.

The Technical Committee Report does not dictate the level of instruction The Task List developed represents the entire occupational field. Schools and Institutions determine what skills can be taught and what depth of instruction can be provided. They must choose the Tasks to be taught from the Technical Committee Report but are free to determine how many or which ones can be incorporated into their program.

The Technical Committee Report is also used as the primary list for generating Student Profiles. These Profiles are used as a cumulative record of each student's progress. They are printed in a folder format and have levels of performance scales for each Task so that student competence can be recorded for individual skills or tasks. This document will become the main component for Articulation activities in the event that the student desires to go on for additional training or education.

ACKNOWLEDGEMENTS

The Technical Committee process involves personnel from industry who are selected by the Division with assistance from the State Council on Vocational Education. People who serve on the Committees are nominated by local administrators. They generally come from local advisory committees for existing Vocational Education programs or are community and private sector representatives in a capacity to provide the necessary information about industry needs. These people serve with the approval of their employers and give their time and energies to the project without cost. The Division provides reimbursement for per diem and travel. We are indebted greatly to these industry representatives and to their employers for the resources so freely given to the pursuit of ensuring that Idaho students receive the most current training and education possible and that which is demanded by industry.

To this end, the Division recognizes the following people who served on the Technical Committee for Drafting: Carl Henrikson, Boise; Tom Ensley, Caldwell; Dick Lindquist, Idaho Falls; Lloyd Lohf, Post Falls; Ken Helm, Lewiston; Warren Cordingly, Hailey and Deon Romrell, Idaho Falls.

Your support and assistance was very greatly appreciated. Your patience for enduring the educational process is also noted. The students and instructional staff will be much more able to accomplish their respective goals as a result of your contributions.

The curriculum guide development process utilizes instructors selected from existing occupational programs to develop performance objectives and enabling objectives from the task list developed by the technical committee. The committee members selected to serve as writers for this guide were: Mike Durrant, Jeff Blaser, Wayne Rexford, Steve Jackson, Clint Glover, Ralph Burkey, Todd Schwarz, Carl Burstedt, Werner Petzinger, Len Cope.

These contributions are greatly appreciated by the Division and the administrators of programs statewide.

Sho Ueda, Supervisor
Trade, Industrial and Technical Education

Don Eshelby
Director of Program Services

TASK LIST

The task list is a set of occupational skills or "tasks" which are grouped by modules. Each task describes an occupational activity that, when performed, will result in a finished process and can vary, but should always allow an evaluation using the standards which address the operation, appearance, dimensions, or similar characteristics.

The tasks in each module represent the fundamental activities that should be required of any student seeking institutional credit for performing at an acceptable level of competency. The tasks are sequenced to reflect a progression from the curriculum standards which are unique to an institution's instructional program and which should be added upon approval of the administration.

The capability for providing instructional experiences and practical application of the tasks contained in each module will determine the scope of the vocational-technical program. Primary considerations will obviously be the availability of equipment and the expertise of the instructional staff.

Individual records of student progress based on the task list should be developed or adapted by the vocational institution for use in recording the student's attainment of competency by task and module. Each task has a specific performance objective and a series of enabling objectives. The enabling objectives are steps in the procedure of attaining the knowledge and skill specified in the performance objective. Student's progress is measured by successful completion of the enabling objectives by oral, written or performance testing.

CURRICULUM FRAMEWORK PROGRAM AREA: TRADE AND INDUSTRIAL
IDAHO DIVISION OF VOCATIONAL EDUCATION REVISION DATE: February 1992
PROGRAM TITLE: DRAFTING & DESIGN TECHNOLOGY
IDAHO CODE NUMBER: 6130 CIP#: 48.0101 & 15.0202

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as drafters (007.281-018), or to provide supplemental training for persons previously or currently employed in these occupations.

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, drafting standards, math skills and drafting office practices to assist mathematical, electrical and electronic, architectural, chemical, civil, or other engineers in the design and drafting of electrical circuits, machines, structures, weldments or architectural plans and the development of detailed working drawings and related specifications for mechanical devices and machinery including production drawings, jigs and fixtures, tools and dies, pneumatic/hydraulic applications and advanced computer aided drawings.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program and provide instruction in drafting machines, office reproduction equipment, drafting tools, computer aided design systems, drafting track, technical publication and reference materials, drafting materials, and supplies common to industry.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing leadership training experiences and reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal. The student must receive compensation for work performed.

The typical length of this program for the average achieving student is 1800 hours for postsecondary or 900 hours for secondary. Multi-period blocks of instruction are required for secondary programs.

IV. INTENDED OUTCOMES: After successfully completing this program, the student will be able to:

01. Demonstrate employability skills and habits.
02. Demonstrate knowledge of program.
03. Apply basic drafting skills.
04. Solve technical mathematical problems.
05. Prepare multi-view drawings.
06. Prepare sectional views.
07. Prepare auxiliary drawings.
08. Apply basic dimensioning.
09. Prepare pictorial drawings.
10. Prepare sheet metal developments.
11. Utilize drafting applications.
12. Prepare basic charts and graphs.
13. Perform basic computer skills.
14. Prepare basic computer aided drawings.
15. Prepare basic architectural drawings.
16. Prepare basic structural drawings.
17. Prepare basic civil drawings.
18. Prepare basic electrical/electronic drawings.
19. Prepare basic pneumatic/hydraulic drawings.
20. Prepare basic mechanical drawings.
21. Prepare advanced electrical/electronic drawings.
22. Prepare advanced computer aided drawings.
23. Prepare advanced mechanical drawings.
24. Prepare tool and die drawings.
25. Apply basic surveying skills.

V. LEVEL OF INSTRUCTION: The tasks in this program are rated according to the level of skills required for: (a) entry level for employment, (b) retention level for those employed in drafting technology, and (c) advanced level for those skills required of experienced or specialty oriented draft persons. The following codes represent the skill level of the tasks.

E	Student is introduced to the concepts and is familiar with basic operational functions. This level denotes basic instructional content necessary to enter the job market.
R	Student can perform the activity with minimum supervision. This level denotes instructional level necessary to retain a job.
A	Student can perform the activity without supervision and will meet industry standards. This level denotes advanced skill training necessary for job retention and promotion.

STUDENT PERFORMANCE STANDARDS　EFFECTIVE DATE: February 1992

PROGRAM AREA: Trade and Industrial　SECONDARY:________

PROGRAM TITLE: Drafting & Design Technology　POSTSECONDARY:______

01.0 DEMONSTRATE EMPLOYABILITY SKILLS AND HABITS

The student will be able to:

E 01.01 Identify employment opportunities.
E 01.02 Apply employment seeking skills.
E 01.03 Interpret employment capabilities.
E 01.04 Demonstrate appropriate work behavior.
E 01.05 Maintain safe and healthy environment.
E 01.06 Maintain business-like image.
E 01.07 Maintain working relationships with others.
E 01.08 Communicate on the job.
E 01.09 Adapt to change.
E 01.10 Demonstrate a knowledge of business.
E 01.11 Perform mathematical calculations.
E 01.12 Compile a portfolio

02.0 DEMONSTRATE KNOWLEDGE OF PROGRAM

The student will be able to:

E 02.01 Identify school regulations, classroom procedures and grading practices.
E 02.02 Apply safety practices.
E 02.03 Identify drafting careers and occupational concepts.
E 02.04 Identify course overview.
E 02.05 Locate resource materials and audio-visual training equipment.

03.0 APPLY BASIC DRAFTING SKILLS

The student will be able to:

E 03.01 Apply safety practices.
E 03.02 Use drafting equipment, measuring scales, drawing media, drafting instruments and consumable materials.
E 03.03 Use conversion tables for fractions, decimals and metric measurements.
E 03.04 Identify line styles, weights (alphabet of lines).
E 03.05 Prepare title blocks and other drafting formats.
E 03.06 Apply various freehand and other lettering techniques.
E 03.07 Apply axonometric, oblique and perspective sketching techniques.
E 03.08 Prepare basic geometric construction.
E 03.09 Prepare multi-view sketches.
E 03.10 Prepare multi-view drawings.
E 03.11 Prepare sectional views.

E 03.12 Prepare auxiliary views.
E 03.13 Prepare dimensioned drawings.
E 03.14 Prepare pictorial drawings.
E 03.15 Apply inking techniques.
E 03.16 Apply systems drafting techniques.
E 03.17 Interpret reports and specifications.
E 03.18 Use reproduction equipment i.e., blueprint machines and office copy equipment.

04.0 SOLVE TECHNICAL MATHEMATICAL PROBLEMS

The student will be able to:

E 04.01 Solve arithmetic problems.
E 04.02 Solve algebraic problems.
E 04.03 Solve geometry problems.
E 04.04 Solve trigonometric problems.
E 04.05 Apply multiple discipline calculations.

05.0 PREPARE MULTI-VIEW DRAWINGS

The student will be able to:

E 05.01 Select proper drawing scale, views and layout.
E 05.02 Prepare drawings containing horizontal and vertical surfaces.
E 05.03 Prepare drawings containing circles and/or arcs.
E 05.04 Prepare drawings containing inclined and oblique plane surfaces.
E 05.05 Prepare drawings incorporating partial views.
E 05.06 Prepare drawings incorporating removed details and conventional breaks.

06.0 PREPARE SECTIONAL VIEWS

The student will be able to:

E 06.01 Prepare drawings containing full or half sectional views.
E 06.02 Prepare drawings containing offset sectional views.
E 06.03 Prepare drawings containing revolved sectional views.
E 06.04 Prepare drawings containing removed or broken-out sectional views.
E 06.05 Prepare a sectional assembly drawing applying material symbology.

07.0 PREPARE AUXILIARY VIEWS

The student will be able to:

E 07.01 Prepare drawings containing auxiliary views.
E 07.02 Prepare drawings containing auxiliary views that include curved lines.
E 07.03 Prepare drawings containing auxiliary sections.
E 07.04 Prepare drawings containing secondary auxiliary views.

08.0 APPLY BASIC DIMENSIONING

The student will be able to:

E 08.01 Prepare drawings containing linear dimensions and notes.
E 08.02 Prepare drawings that include angular dimensions.
E 08.03 Prepare drawings that include circular dimensions.
E 08.04 Prepare drawings using metric dimensions.
E 08.05 Prepare drawings using surface characteristic notations.

09.0 PREPARE PICTORIAL DRAWINGS

The student will be able to:

E 09.01 Prepare isometric drawings.
E 09.02 Prepare diametric drawings.
E 09.03 Prepare cavalier drawings.
E 09.04 Prepare cabinet drawings.
E 09.05 Prepare pictorial drawings.

10.0 PREPARE SHEET METAL DEVELOPMENTS

The student will be able to:

E 10.01 Prepare sheetmetal development drawings.

11.0 UTILIZE DRAFTING APPLICATIONS

The student will be able to:

E 11.01 Use drafting and graphic appliques.
E 11.02 Use cut and paste techniques.
E 11.03 Identify photo techniques.
E 11.04 Prepare overlay drawings.
E 11.05 Make drawing changes on reproducible drawings.

12.0 PREPARE BASIC CHARTS AND GRAPHS

The student will be able to:

E 12.01 Prepare bar, pie, and flow charts.
E 12.02 Prepare rectangular and semi-logarithmic graphs.

13.0 PERFORM BASIC COMPUTER SKILLS

The student will be able to:

E 13.01 Use a full size standard keyboard.
E 13.02 Use a monitor.
E 13.03 Use a disk operating system.
E 13.04 Use a dual disk drive microcomputer.
E 13.05 Use a hard disk.
E 13.06 Demonstrate a knowledge of commands required to operate a specific computer software program.
E 13.07 Use a translation utility format.

14.0 PREPARE BASIC COMPUTER AIDED DRAWINGS

The student will be able to:

E 14.01 Use a digitizer.
E 14.02 Use a plotter.
E 14.03 Select the proper drawing scale.
E 14.04 Produce charts and graphs.
E 14.05 Produce multi-view drawings with dimensions.
E 14.06 Produce sectional view drawings with dimensions.
E 14.07 Produce auxiliary view drawings with dimensions.
E 14.08 Produce pictorial drawings.

15.0 PREPARE BASIC ARCHITECTURAL DRAWINGS

The student will be able to:

R 15.01 Interpret vendors' catalogs, technical tables and building codes.
R 15.02 Prepare floor plan drawings with dimensions.
R 15.03 Prepare foundation plan and detail drawings with dimensions.
R 15.04 Prepare elevation drawings with dimensions.
R 15.05 Prepare section drawings with dimensions.
R 15.06 Prepare schedules.
R 15.07 Prepare landscape layouts.
A 15.08 Build architectural models.
A 15.09 Prepare truss drawings.
A 15.10 Prepare stairway drawings.
A 15.11 Prepare fireplace/chimney drawings.
A 15.12 Prepare plot plan drawings.
A 15.13 Prepare plumbing plan drawings.
A 15.14 Prepare HVAC drawings.
A 15.15 Prepare electrical plan drawings.

16.0 PREPARE BASIC STRUCTURAL DRAWINGS

The student will be able to:

R 16.01 Use structural member and reinforcing concrete manuals and technical tables.
R 16.02 Detail structural beam connections.
R 16.03 Detail concrete reinforcements.
R 16.04 Prepare materials take off lists.
A 16.05 Draw structural framing plans and elevations.
A 16.06 Identify welding symbols.

17.0 PREPARE BASIC CIVIL DRAWINGS

The student will be able to:

R 17.01 Interpret technical standards for soils and construction materials.
R 17.02 Prepare topographic drawings.
R 17.03 Prepare drainage drawings.
R 17.04 Prepare plan and profile drawings.
R 17.05 Prepare traverse drawings.
R 17.06 Prepare plat drawings.
R 17.07 Prepare street layout drawings.

18.0 PREPARE BASIC ELECTRICAL/ELECTRONIC DRAWINGS

The student will be able to:

R 18.01 Interpret basic electrical/electronic standards and symbols.
R 18.02 Prepare schematic drawings.
R 18.03 Prepare cable drawings.
R 18.04 Prepare component drawings.
R 18.05 Prepare logic diagrams.
R 18.06 Prepare control panel drawings.

19.0 PREPARE BASIC PNEUMATIC/HYDRAULIC DRAWINGS

The student will be able to:

R 19.01 Interpret basic pneumatic/hydraulic standards and symbols.
R 19.02 Prepare piping drawings.
R 19.03 Prepare isometric drawings.
R 19.04 Prepare sectional diagrams.
R 19.05 Prepare graphic symbols.
A 19.06 Prepare process and instrumentation diagrams.
A 19.07 Prepare pump and motor drawings.
A 19.08 Prepare cylinder and piston diagrams.
A 19.09 Prepare valve drawings.
A 19.10 Prepare pump section drawings.

20.0 PREPARE BASIC MECHANICAL DRAWINGS

The student will be able to:

R 20.01 Interpret basic mechanical standards and symbols.
R 20.02 Prepare detail drawings.
R 20.03 Prepare weldment drawings.
R 20.04 Prepare detailed bearing drawings.
R 20.05 Prepare casting drawings.
R 20.06 Prepare forging drawings.
R 20.07 Prepare tool drawings.
R 20.08 Prepare molding diagrams.
R 20.09 Prepare drawings with special processed holes.
R 20.10 Prepare stamping drawings.
R 20.11 Prepare numerical control drawings.
R 20.12 Prepare assembly drawings.

21.0 PREPARE ADVANCED ELECTRICAL/ELECTRONIC DRAWINGS

The student will be able to:

R 21.01 Prepare connection drawings
R 21.02 Prepare interconnection drawings.
A 21.03 Prepare printed circuit board drawings.
R 21.04 Prepare harness drawings.
A 21.05 Prepare package drawings.
R 21.06 Describe operation of electromechanical components.
R 21.07 Prepare motor control drawings.

22.0 PREPARE ADVANCED COMPUTER AIDED DRAWINGS

The student will be able to:

R 22.01 Operate work terminal.
R 22.02 Utilize system commands.
R 22.03 Perform drafting procedures.
R 22.04 Operate peripheral equipment.
R 22.05 Apply specialized CAD functions.
A 22.06 Produce architectural drawings.
A 22.07 Produce structural steel and reinforcing detail drawings.
A 22.08 Produce map drawings.
A 22.09 Produce civil drawings.
A 22.10 Produce electrical/electronic drawings.
A 22.11 Produce pneumatic/hydraulic drawings.
A 22.12 Produce pattern shop detail drawings.
A 22.13 Produce casting drawings.
A 22.14 Produce forging detail drawings.
A 22.15 Produce machining detail drawings.

A 22.16 Produce stamping drawings.
A 22.17 Produce weldment drawings.
A 22.18 Produce assembly drawings.
A 22.19 Produce installation drawings.

23.0 PREPARE ADVANCED MECHANICAL DRAWINGS

The student will be able to:

R 23.01 Identify the various manufacturing methods.
R 23.02 Resolve problems by descriptive geometry and revolutions.
R 23.03 Prepare advanced surface drawings.
R 23.04 Use precision dimensioning to include geometric characters.
R 23.05 Use precision measuring instruments.
A 23.06 Make recommended engineering changes on drawings.
A 23.07 Prepare fastener drawings.
A 23.08 Prepare cam drawings.
A 23.09 Prepare gear drawings.
A 23.10 Prepare spring drawings.
A 23.11 Prepare pneumatic/hydraulic drawings.
A 23.12 Prepare pulley and chain drive drawings.

24.0 PREPARE TOOL AND DIE DRAWINGS

The student will be able to:

A 24.01 Design jigs and fixtures.
A 24.02 Design cutting dies.
A 24.03 Design forming dies.

25.0 APPLY BASIC SURVEYING SKILLS

The student will be able to:

R 25.01 Describe basic surveying skills.
R 25.02 Apply different types of measurements.
R 25.03 Prepare standard notes.
R 25.04 Operate surveying equipment.
R 25.05 Perform surveys.

CURRICULUM GUIDE FOR DRAFTING AND DESIGN TECHNOLOGY

MODULE I

EMPLOYABILITY SKILLS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE I - EMPLOYABILITY SKILLS AND HABITS

This is one of a series of modules which comprise the Idaho Curriculum Guide for Drafting Technology. Each module contains a listing of the tasks, performance objectives, and enabling objectives required to enable a student to achieve competency in a specific system or field of study within the basic drafting technician occupational field. The numbering of these modules is not intended to dictate an order of instruction or scheduling. The order in which these modules may be taught is determined by each institution and its instructors.

Each task describes an occupational activity which will result in a finished process or product. The tasks listed in each module represent the basic activities required of each student to demonstrate entry level competence for that specific system or field of study within the drafting occupation. Individual records of student performance in completing the tasks listed within each module should be maintained.

Although some provision is made for basic mathematics and communication skills within this guide, they may not be adequate to meet the needs of individual students. Counseling, guidance, and diagnostic test results may indicate a need for further preparation in these areas. In such cases, instructors are encouraged to utilize the resources and personnel within the institution to improve or complement the instructional process.

The benefits to students and institutions derived from this curriculum guide should be considerable. Articulation of students from secondary to post-secondary programs will be aided through the use of a single curriculum guide. The guide provides a tool for evaluation of local curriculum and programs. The guide may be used in a flexible manner to assure that drafting programs meet the needs of local business and industry.

It is the goal of this program guide to provide a level of instruction which will impart entry level employment skills. Students should be carefully counseled on the importance of attaining competency in the tasks assigned. As in virtually all occupations today, drafting technicians will require periodic up-dating and review in the future. It is important that each student understand that meeting the program standards is essential not only to obtain employment today but also to have a base upon which to retain employment in the future.

2

EMPLOYABILITY SKILLS AND HABITS

01.01 TASK: Identify Employment Opportunities

PERFORMANCE OBJECTIVE: Given the information resources of a library, obtain and compile the information needed to seek a job.

ENABLING OBJECTIVES:

1. Identify the requirements for a job/job description.
2. Investigate educational opportunities.
3. Investigate occupational opportunities.
4. Locate resources for finding employment.
5. Confer with prospective employers.
6. Identify job trends.
7. Research geographic locations.

01.02 TASK: Apply Employment-Seeking Skills

PERFORMANCE OBJECTIVE: Given appropriate information, locate a job opportunity, prepare and take an interview for it, complete the required tests, forms and applications, and evaluate the job opportunity.

ENABLING OBJECTIVES:

1. Locate a job opening.
2. Complete a resume.
3. Prepare for an interview.
4. Participate in an interview.
5. Complete tests required.
6. Complete forms required.
7. Complete an application letter.
8. Complete a follow-up letter.
9. Complete an acceptance letter.
10. Evaluate a job offer.
11. Evaluate a job rejection.

01.03 TASK: Interpret Employment Capabilities

PERFORMANCE OBJECTIVE: Given the assignment to explain how your capabilities make you employable, demonstrate how to match skills and experience to a job.

ENABLING OBJECTIVES:

1. Match personal interest to job area.
2. Match personal aptitudes to job area.
3. Verify personal abilities.
4. Identify an immediate work goal.
5. Develop a career plan.

1.04 TASK: Demonstrate Appropriate Work Behavior

PERFORMANCE OBJECTIVE: Given the responsibility of an employee in a new job, demonstrate knowledge of appropriate behavior in the work place.

ENABLING OBJECTIVES:
1. Exhibit dependability.
2. Demonstrate punctuality.
3. Follow rules and regulations.
4. Explain the consequences of dishonesty.
5. Complete assignments accurately and on time.
6. Control personal emotions.
7. Take responsibility for decisions and actions
8. Take pride in work and be a loyal worker.
9. Learn to handle pressures and tensions.
10. Demonstrate ability to set priorities.
11. Demonstrate problem-solving skills.

01.05 TASK: Maintain Safe and Healthy Environment

PERFORMANCE OBJECTIVE: Given the responsibility of an employee in a new job, demonstrate knowledge of safety in the workplace.

ENABLING OBJECTIVES:
1. Comply with safety and health rules.
2. Select correct tools and equipment.
3. Utilize equipment correctly.
4. Use appropriate action during emergencies.
5. Maintain clean and orderly work area.
6. Demonstrate personal hygiene and cleanliness.
7. Identify and locate Material Safety Data Sheets (MSDS).

01.06 TASK: Maintain a Business-Like Image

PERFORMANCE OBJECTIVE: Given a responsibility to perform the duties of a new job, with a new employer, demonstrate a knowledge of the actions and behaviors which will project a business-like image.

ENABLING OBJECTIVES:
1. Participate in company or agency orientation.
2. Demonstrate knowledge of company or agency products and services.
3. Exhibit positive behavior.
4. Read current job-related publications.
5. Support and promote employer's company image and purpose.
6. Maintain appearance to comply with company standards.

01.07 TASK: Maintain Working Relationships with Others

PERFORMANCE OBJECTIVE: Given the responsibility to perform the duties of a new job, with a new employer, demonstrate a knowledge of how to successfully work with others.

ENABLING OBJECTIVES:
1. Work productively with others.
2. Show empathy, respect and support for others.
3. Demonstrate procedures and assist others when necessary.
4. Recognize problems and work toward their solution.
5. Minimize the occurrence of problems.
6. Channel emotional reactions in positive ways.

01.08 TASK: Communicate on the Job

PERFORMANCE OBJECTIVE: Given the responsibility to perform the duties of a new job, with a new employer, demonstrate a knowledge of how to successfully communicate with others.

ENABLING OBJECTIVES:
1. Read and comprehend written communications and information.
2. Use correct grammar.
3. Speak effectively with others.
4. Use job-related terminology.
5. Listen attentively.
6. Write legibly.
7. Use telephone etiquette.
8. Follow written and oral directions.
9. Ask questions.
10. Locate information in order to accomplish task.
11. Prepare written communication.
12. Utilize keyboarding skills.
13. Utilize computer skills.

01.09 TASK: Adapt to Change

PERFORMANCE OBJECTIVE: Given the responsibility to perform the duties of a new job, with a new employer, demonstrate a knowledge of how to adapt to change.

ENABLING OBJECTIVES:
1. Recognize the need to change.
2. Demonstrate a willingness to learn.
3. Demonstrate flexibility.
4. Participate in continuing education.
5. Seek challenge in the work place.
6. Adjust goals and plans when necessary.

01.10 TASK: Demonstrate a Knowledge of Business

PERFORMANCE OBJECTIVE: Given the responsibility to perform the duties of a new job, with a new employer, demonstrate a knowledge of the role of that business, its employees, and the free enterprise system.

ENABLING OBJECTIVES:

1. Explain the role of business in the free enterprise system.
2. List the responsibilities of employees.
3. Identify the responsibilities of managers and employers.
4. Discuss the opportunities for business ownership or management.
5. Describe the planning required to start a business.
6. Discuss the importance of business meetings.

01.11 TASK: Perform Mathematical Calculations

PERFORMANCE OBJECTIVE: Given mathematics problems associated with drafting applications, solve accurately within a specified time period. (See Module IV Solve Technical Mathematical Problems for additional skills needed.)

ENABLING OBJECTIVES:

1. Add and subtract whole numbers, decimals and fractions.
2. Multiply and divide whole numbers, decimals and fractions.
3. Convert numbers between forms expressed as fractions, decimals and percents.
4. Convert between standard American units of measure.
5. Convert between standard American units and metric units.
6. Apply descriptive geometry skills to drafting practices.

01.12 TASK: Compile a Portfolio

PERFORMANCE OBJECTIVES: Given examples of portfolios and instruction on developing portfolios, students will compile and organize a portfolio of personal drawings and information for presentation.

ENABLING OBJECTIVES:

1. Define portfolio.
2. Explain the purpose of a portfolio.
3. List procedures for compiling and organizing a portfolio.
4. Demonstrate the ability to develop a portfolio.
5. Demonstrate the ability to present a portfolio.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE II

ORIENTATION INFORMATION

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE II - DEMONSTRATE KNOWLEDGE OF PROGRAM

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Although some provision is made for basic mathematics and communication skills within this guide, they may not be adequate to meet the needs of individual students. Counseling, guidance, and diagnostic test results may indicate a need for further preparation in these areas. In such cases, instructors are encouraged to utilize the resources and personnel within the institution to improve or complement the instructional process.

The benefits to students and institutions derived from this curriculum guide should be considerable. Articulation of students from secondary to post-secondary programs will be aided through the use of a single curriculum guide. The guide provides a tool for evaluation of local curriculum and programs. The guide may be used in a flexible manner to assure that drafting programs meet the needs of local business and industry.

It is the goal of this program guide to provide a level of instruction which will impart entry level employment skills. Students should be carefully counseled on the importance of attaining competency in the tasks assigned. As in virtually all occupations today, drafting technicians will require periodic up-dating and review in the future. It is important that each student understand that meeting the program standards is essential not only to obtain employment today but also to have a base upon which to retain employment in the future.

DEMONSTRATE KNOWLEDGE OF PROGRAM

02.01 TASK: Identify School Regulations, Classroom Procedures and Grading Practices

PERFORMANCE OBJECTIVE: Following the presentation of institutional guidelines for regulations, procedures and policies the student will be able to answer specific questions.

ENABLING OBJECTIVES:

1. Review institutional regulations regarding general conduct and student expectations.
2. Review standard procedures pertaining specifically to the drafting lab/classroom.
3. Review grading policies and practices as they pertain to the drafting course.
4. Analyze the relationships of the regulations, procedures and policies with respect to satisfactory course completion, transfer and/or graduation requirements.

02.02 TASK: Apply Safety Practices

PERFORMANCE OBJECTIVE: Following the presentation of drafting lab safety procedures, the student will implement proper practices to the satisfaction of the instructor.

ENABLING OBJECTIVES:

1. Review drafting lab safety considerations.
2. Demonstrate proper handling and storage of small drafting tools (i.e. compass, dividers, pencils, etc.)
3. Search the drafting lab for potential safety hazards (i.e. open drawers, loose power cords, improperly stored ammonia, etc.)
4. Demonstrate proper procedures for inspection and/or repair of electrical tools.
5. Demonstrate safe and proper care and handling of the computer and storage disks.
6. Describe proper practice and procedure in the event of ammonia spills, including the exposure to or ingestion of ammonia.
7. Discuss safety considerations outside the drafting lab that may be encountered at job-sites, manufacturing facilities and other sites.

02.03 TASK: Identify Drafting Careers and Occupational Concepts

PERFORMANCE OBJECTIVE: Given copies of the Dictionary of Occupational Titles, Occupational Outlook Handbook, and access to the Career Information System, the student will describe the occupation and responsibilities of drafting technicians, relate and understanding of the various drafting disciplines, demonstrate a knowledge of the relationships between drafting technicians, designers, architects, and engineers.

ENABLING OBJECTIVES:

1. Review prescribed information concerning drafting careers and responsibilities.

2. List the general responsibilities of the drafting technician.
3. Describe the differences between the various drafting disciplines.
4. Compare the occupational descriptions of drafter, designer, engineer, and architect and describe their working relationships.
5. Draw a diagram illustrating a possible chain of promotions and increased responsibility and duties from the entry level through an ultimate drafting-based career goal.

02.04 TASK: Identify Course Overview

PERFORMANCE OBJECTIVE: Following the presentation of the drafting course of study and completion requirements, the student will relate an understanding of the intent and expectation of the program.

ENABLING OBJECTIVES:

1. Review the program description and/or syllabus.
2. Discuss the components of the course with the instructor.
3. Discuss the relevance of the program content to the drafting profession.

02.05 TASK: Locate Resource Materials and Auto-Visual Training Equipment

PERFORMANCE OBJECTIVE: The student shall demonstrate a familiarity with the locations and proper use of learning aids and resources.

ENABLING OBJECTIVES:

1. Tour the drafting lab under the supervision of the instructor or student (who has previously completed this task), and identify the locations of various available reference materials, resources and learning aids.
2. Discuss the application of each resource and its safe and proper use.
3. Assist the instructor by guiding a student on a tour of the lab resources, describing proper application and use of them.

CURRICULUM GUIDE FOR

DRAFTING AND DESIGN TECHNOLOGY

MODULE III

APPLY BASIC DRAFTING SKILLS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE III - APPLY BASIC DRAFTING SKILLS

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APPLY BASIC DRAFTING SKILLS

03.01 TASK: Apply Safety Practices

PERFORMANCE OBJECTIVE: Given a presentation of drafting lab safety procedures, the student will demonstrate safe and efficient work practices.

ENABLING OBJECTIVES:

1. **List drafting lab safety rules and considerations.**
2. **Identify potential drafting lab safety hazards (i.e. open drawers, loose powercords, improperly stored ammonia, etc.)**
3. **Demonstrate proper handling and storage of small drafting tools (i.e. compass, dividers, pencils, etc.).**
4. **Explain proper practice and procedure in the event of ammonia spills, including the exposure to or ingestion of ammonia.**
5. **Demonstrate proper procedure for inspection and/or repair of electrical tools.**
6. **Identify safety factors to consider when working with computers.**
7. **Demonstrate safe and proper care and handling of the computer and storage disks.**
8. **Identify the safe and efficient flow of work as it is produced from start to finish.**

03.02 TASK: Use Drafting Equipment, Measuring Scales, Drawing Media, Drafting Instruments and Consumable Materials

PERFORMANCE OBJECTIVE: Given drafting equipment, measuring scales, drawing media, drafting instruments and consumable materials, students will demonstrate the purpose and proper usage of each.

ENABLING OBJECTIVES:

1. **Identify drafting equipment, (i.e. T-square, parallel bar, drafting arm, scales, instruments, etc.)**
2. **Demonstrate the ability to set up a drafting table with proper drafting equipment.**
3. **Demonstrate a correct method for cleaning drafting equipment.**
4. **Identify a variety of measuring scales and applications of each.**
5. **Describe the care of measuring scales.**
6. **Describe the characteristics of a variety of different drawing media (i.e. vellum, rag, mylar, etc.)**
7. **Identify drafting instruments (i.e. compass, dividers, etc.)**
8. **Explain the proper methods of cleaning and caring for drafting instruments.**
9. **Match the type of consumable materials used in drafting with their purpose. (i.e. lead, pencils, ink erasers, cleaning pads, etc.)**

03.03 TASK: Use Conversion Tables for Fractions, Decimals and Metric Measurements

PERFORMANCE OBJECTIVE: Given conversion tables, students will demonstrate the ability to convert fractions, decimals and metric measurements from one to another with 100 percent accuracy.

ENABLING OBJECTIVES:
1. Identify conversion tables.
2. State the purpose of conversion tables.
3. Convert fractions into decimal equivalents.
4. Convert fractional inches into metric equivalents.
5. Convert decimals into fractional equivalents.
6. Convert metric units into fractional inches.
7. Convert metric units into decimal inches.
8. Convert decimal inches to metric equivalents.

03.04 TASK: Identify Line Types, Weights, (Alphabet of Lines)

PERFORMANCE OBJECTIVE: Given a variety of drawings, students will identify ANSI line types and weights with 100 percent accuracy.

ENABLING OBJECTIVES:
1. Explain the characteristics of acceptable line work.
2. Identify line types.
3. Describe the applications of various line types.
4. Identify line preference.

03.05 TASK: Prepare Title Blocks and Other Drafting Formats

PERFORMANCE OBJECTIVE: Given several examples of title blocks, drafting equipment, materials and instruction, students will prepare title blocks/strips and other drafting formats.

ENABLING OBJECTIVES:
1. Identify common sheet sizes.
2. Demonstrate techniques for drawing thick, dense, black uniform border lines.
3. Demonstrate ability to choose proper border line margins.
4. Demonstrate the ability to design a title block/strip.

03.06 TASK: Apply Various Freehand and Other Lettering Techniques

PERFORMANCE OBJECTIVE: Given examples of acceptable lettering styles and formats, a lettering guide, lettering templates and the necessary drafting equipment and materials, the student will letter and number drawings using acceptable style, proportion spacing and neatness.

ENABLING OBJECTIVES:

1. Identify drafting tools used in lettering.
2. Demonstrate the use of these tools.
3. Identify different lettering styles.
4. Describe the correct applications for using upper and lower case letters.
5. Identify appropriate use and application of lettering styles.
6. Demonstrate the correct proportioning and spacing techniques for both lettering and numbering, including fractions.
7. Demonstrate the correct use of a lettering guide/template for both lettering and numbering, including fractions.

03.07 TASK: Apply Axonometric, Oblique and Perspective Sketching Techniques

PERFORMANCE OBJECTIVE: Given basic drafting equipment, materials, information, examples, and sketching techniques, prepare axonometric, oblique, and perspective sketches. The sketches must be drawn proportionally, using proper techniques and line quality.

ENABLING OBJECTIVES:

1. State the purpose of sketching.
2. Define the nature of a sketch.
3. Identify the proper grades of pencil leads appropriate for sketching.
4. Explain why surface texture of paper, pencil pressure, and pencil grades must be considered in free hand sketching.
5. Identify types of lines encountered in sketching objects.
6. Describe how to freehand sketch straight lines, circles, and curves.
7. Define the term proportion and explain its importance to sketching.
8. Demonstrate how to estimate lengths, sizes and proportions.
9. Explain the use of graph paper in sketching.
10. Explain the overlay method of developing sketches.
11. Identify three types of pictorial sketches.
12. Identify three types of axonometric sketches.
13. Identify three types of oblique sketches.
14. Identify three types of perspective sketches.
15. Demonstrate the ability to develop pictorial sketches.
16. Describe various uses and applications of axonometric, oblique, and perspective sketches.

03.08 TASK: Prepare Basic Geometric Construction

PERFORMANCE OBJECTIVE: Given basic drafting equipment, materials, references, and necessary information, prepare drawings showing geometric construction.

ENABLING OBJECTIVES:
1. State the purpose of geometric construction.
2. Define terms related to geometric construction.
3. Identify geometric shapes.
4. Construct geometric forms.
5. Prepare drawings using geometric construction.

03.09 TASK: Prepare Multi-View Sketches

PERFORMANCE OBJECTIVE: Given the necessary drafting equipment, materials and instruction, students will prepare multi-view freehand sketches.

ENABLING OBJECTIVES:
1. State purpose of sketching.
2. Identify grades of pencils used in sketching.
3. Explain why surfaces, texture of paper, pencil pressure, and pencil grades must be considered in freehand sketching.
4. Demonstrate line weights in sketching.
5. Identify planes of projection.
6. Explain ways of drawing sketches to proper proportion.
7. Demonstrate how to sketch straight lines, circles and curves.
8. Prepare multi-view sketches.

3.10 Prepare Multi-View Drawings

PERFORMANCE OBJECTIVE: Given the proper tools, supplies, instructional information and demonstrations, perform procedures and steps required to prepare multi-view drawings to acceptable industry standards.

ENABLING OBJECTIVES:
1. Identify planes of projection.
2. Select necessary views for multi-view drawings.
3. Distinguish between the types of projection systems.
4. Draw third-angle projection multi-view drawings.
5. List possible views in multi-view drawings.
6. List commonly used techniques for transferring dimensions from one view to the next.
7. Identify normal, inclined, and oblique planes in multi-view drawings.
8. Select correct line usage in multi-view drawings.
9. Identify line thicknesses used in multi-view drawings.
10. State the purpose of runouts, fillets and rounds.

11. Demonstrate the ability to center multi-view drawings.
12. Project different types of planes and surfaces on multi-view drawings.
13. Prepare multi-view drawings.

03.11 TASK: Prepare Sectional Views

PERFORMANCE OBJECTIVE: Given the necessary drafting tools, equipment, supplies and instruction, construct sectional views to acceptable industry standards.

ENABLING OBJECTIVES:

1. Define terms used by drafters to describe sectional views.
2. Explain the purpose of a sectional view.
3. Identify types of sectional views.
4. Identify material symbols as they appear in sectional views.
5. Identify line thickness used in sectional views.
6. Describe the procedures for drawing sectional views.
7. Describe the procedures for drawing special features such as fasteners, webs, etc..
8. Prepare drawings with sectional views.

03.12 TASK: Prepare Auxiliary Views

PERFORMANCE OBJECTIVE: Given the necessary drafting equipment, materials, instruments and primary auxiliary views drawings must incline surfaces.

ENABLING OBJECTIVES:

1. Explain the purpose of auxiliary views.
2. Name the views that result as an auxiliary projection from a principle view.
3. Define terms used to describe auxiliary views.
4. Project foreshortened lines, points, planes and curved surfaces in auxiliary views.
5. Prepare drawings with auxiliary views.

03.13 TASK: Prepare Dimensioned Drawings

PERFORMANCE OBJECTIVES: Given the necessary drafting equipment, working drawings, materials and instruction, apply the correct dimensioning techniques to describe size and location of all features of a multi-view drawing to acceptable industry standards.

ENABLING OBJECTIVES:

1. Identify notes for dimensioning standard features.
2. Identify lines and symbols used on a dimensioned drawing.
3. Describe the methods for applying notes and symbols on multi-view drawings.
4. Demonstrate how to space dimensions.
5. Demonstrate how to draw arrowheads, extension lines, and dimension lines.
6. Distinguish between size description and location description.

7. Explain the difference between the aligned and unidirectional systems for dimensioning.
8. State the purpose of dual dimensioning.
9. Prepare dimensioned drawings.

03.14 TASK: Prepare Pictorial Drawings

PERFORMANCE OBJECTIVE: Given the necessary drafting equipment, working drawing, materials and instruction, construct a variety of pictorial drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List three types of pictorial drawings.
2. Identify the common application of the three types of pictorial drawings.
3. List advantages and disadvantages of each type of pictorial drawing.
4. Define axonometric projection.
5. Identify three types of axonometric projections.
6. Describe the procedure for making an isometric drawing
7. Explain how to construct non-isometric lines.
8. Explain how to construct angles, curves and circles in isometric.
9. Name three types of obliques.
10. Explain the advantage of using obliques to illustrate objects with one irregularly shaped surface.
11. Describe the procedure for constructing an oblique.
12. Define perspective drawings.
13. Describe procedures for constructing a perspective drawings.
14. List three types of perspectives.
15. Define terms associated with perspective drawings.
16. Describe the procedure for centering pictorial drawings.
17. Prepare pictorial drawings.

03.15 TASK: Apply Inking Techniques

PERFORMANCE OBJECTIVE: Given the necessary drafting equipment, drawings, materials and instruction, prepare drawings using technical pens to acceptable industry standards.

ENABLING OBJECTIVES:
1. Prepare drawing media to receive ink.
2. Identify types of drawing inks.
3. Identify different types of pen points.
4. List procedures for proper use and care for technical pens.
5. Identify films and other drawing media suitable to use with ink.
6. List useful techniques for working with ink.
7. Identify erasers that will remove inked lines.
8. Prepare drawings using a technical ink pen.
9. Clean and properly store technical pens.

03.16 TASK: Apply Systems Drafting Techniques

PERFORMANCE OBJECTIVE: Given examples, illustrations, instructions and classroom experiences that mirror industries work place and organization, apply industry systems drafting techniques.

ENABLING OBJECTIVES:

1. Explain systems drafting techniques.
2. List drafting room processes for all drawings and reports.
3. Explain the value of a flow chart.
4. Demonstrate the ability to organize different levels of drafting work.
5. Identify ANSI standards.
6. Demonstrate procedures to care for, catalog, and store drawings.
7. List methods of caring for and storing films and different media.
8. Explain microfilm processing.
9. Describe the procedure to reproduce a master drawing.
10. Describe the procedures to revise a drawing while without altering the original.
11. List techniques, tools and materials used in revision work including cut and paste applications.

03.17 TASK: Interpret Reports and Specifications

PERFORMANCE OBJECTIVE: Given examples of reports and specifications from industry, read, analyze and interpret these reports and specifications.

ENABLING OBJECTIVES:

1. Define reports and specifications.
2. Explain the importance of reports and specifications as they affect a drawing project.
3. Explain the importance of interacting with the designer of a project through reports and specifications.
4. Consider environmental and other impacts through the reports and specifications.
5. Plan an approach to producing the working drawings for the project that reflect the scope, design specifications and available capital.

03.18 TASK: Use Reproduction Equipment i.e., Blueprint Machines and Office Copy Equipment

PERFORMANCE OBJECTIVE: The student shall make a blueprint using a diazo print machine and a xerographic copy of the same original document or drawing and answer questions regarding the differences and similarities between diazo and xerographic processes as well as the media requirements of the original drawing or document.

ENABLING OBJECTIVES:

1. Describe the steps in the diazo reproduction process.
2. Discuss the variation in original document media requirements between the diazo and xerographic processes.

3. Discuss the effects of speed changes in the diazo process on the print.
4. List output options of the diazo process and explain where and how they might be used (i.e. sepias, reproducibles, etc.).
5. Describe the steps in the xerographic reproduction process.
6. From a common original drawing or document run a blueprint and make a xerographic copy.

CURRICULUM GUIDE FOR

DRAFTING AND DESIGN TECHNOLOGY

MODULE IV

SOLVE TECHNICAL MATHEMATICAL PROBLEMS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE IV - SOLVE TECHNICAL MATHEMATICAL PROBLEMS

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SOLVE TECHNICAL MATHEMATICAL PROBLEMS

04.01 TASK: Solve Arithmetic Problems

PERFORMANCE OBJECTIVE: Given a set of parameters and appropriate tools, solve arithmetic problems that relate to the drafting field. The problem solutions will require manipulation of decimals, and fractions in performing addition, subtraction, multiplication, and division. All work will conform to specified standards for layout, and neatness.

ENABLING OBJECTIVES:

1. Sketch objects relating to given problems.
2. Solve addition problems using decimals and fractions.
3. Solve subtraction problems using decimals and fractions.
4. Solve multiplication problems using decimals and fractions.
5. Solve division problems using decimals and fractions.
6. Solve problems involving a combination of addition, subtraction, multiplication, and division using decimals or fractions.

04.02 TASK: Solve Algebraic Problems

PERFORMANCE OBJECTIVE: Given a set of parameters and appropriate tools, solve applied and theoretical problems related to the drafting field using algebraic principles. Algebraic principles will include simple equations, multiplication, and division of signed numbers, algebraic fractions, advanced equations, graphical methods, equations with more than one unknown, exponents and logarithms, the quadratic equation, and problems in variation. All work will conform to specified standards for layout and neatness.

ENABLING OBJECTIVES:

1. Sketch objects relating to the given problem when applicable.
2. Analyze problems to ascertain the proper solution approach.
3. Describe the steps associated with problem solving relating to drafting applications.
4. Apply the appropriate algebraic principles to solve problems.

04.03 TASK: Solve Geometry Problems

PERFORMANCE OBJECTIVE: Given a set of parameters and appropriate tools, solve applied and theoretical geometry problems relating to the drafting field. The problems will incorporate lines, angles, planes, triangles, polygons, circles and arcs, and solid objects. All work will conform to specified standards for layout and neatness.

ENABLING OBJECTIVES:

1. Define geometric terms associated with drafting applications.
2. Analyze problems to ascertain the appropriate solution.

3. Describe the steps associated with problem solving relating to drafting applications.
4. Construct sketches of the problem solution when appropriate.
5. Solve problems using the appropriate geometric principles.

04.04 TASK: Solve Trigonometric Problems

PERFORMANCE OBJECTIVE: Given a set of parameters and appropriate tools, solve applied and theoretical trigonometric problems relating to the drafting field. Trigonometric principles will include trigonometric functions, characteristics of right triangles, the sine law, cosine law, and oblique triangles. All work will conform to specified standards for layout and neatness.

ENABLING OBJECTIVES:
1. Define the trigonometric functions.
2. Construct sketches of problems when appropriate.
3. Describe the steps associated with problem solving relating to drafting applications.
4. Apply trigonometric principles to problem solutions.

04.05 TASK: Apply Multiple Discipline Calculations

PERFORMANCE OBJECTIVE: Given a set of parameters and appropriate tools, solve applied and theoretical problems from the drafting field using a combination of arithmetic, algebraic, geometric, and trigonometric functions. All solutions will meet standards for set-up, sketching, problem layout, neatness, and step-by-step procedures.

ENABLING OBJECTIVES:
1. Analyze problems involving multi-discipline mathematics functions.
2. Construct sketches for problems involving multi-discipline mathematics functions.
3. Describe the steps involved in solving problems.
4. Evaluate solutions for accuracy.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE V

PREPARE MULTI-VIEW DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE V - PREPARE MULTI-VIEW DRAWINGS

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PREPARE MULTI-VIEW DRAWINGS

05.01 TASK: Select Proper Drawing Scales, View, and Layout

PERFORMANCE OBJECTIVE: Given pictorial view and drafting tools and materials, prepare orthographic (multi-view) drawings. The drawings must completely define the shape of the parts or objects drawn and must meet the applicable drafting standards for a finished drawings.

ENABLING OBJECTIVES:

1. Describe the procedures for selecting sheet size, drawing scale, spacing of views, and selecting views for an orthographic drawing.
2. Describe the procedure for preparing an orthographic drawing.
3. Explain the importance of checking drawings.
4. Describe the procedures for drawing hidden features and center lines.

05.02 TASK: Prepare Drawings Containing Horizontal and Vertical Surfaces

PERFORMANCE OBJECTIVE: Given dimensioned pictorial view and the drafting tools and materials, prepare drawings containing horizontal and vertical surfaces. The drawings must meet the applicable drafting standards for the finished drawing.

ENABLING OBJECTIVES:
1. Define orthographic projection.
2. Explain how the multi-view drawing system is used to define the shape of an object.
3. Identify the six principle views in an orthographic projection.
4. Describe visualization techniques.
5. Identify the three planes of projection.
6. Prepare views containing horizontal and vertical surfaces.

05.03 TASK: Prepare Drawings Containing Circles and/or Arcs

PERFORMANCE OBJECTIVE: Given partially completed multi-view drawings, and the drafting tools and materials, complete the drawing by adding the necessary arcs and circles. The drawing must meet the applicable drafting standards for finished drawings.

ENABLING OBJECTIVES:
1. Define terms that relate to circles and arcs.
2. Determine size and location of circles and arcs.
3. Describe the order of application for circles, arcs, and lines.
4. Determine the locate of centering lines or points.
5. Prepare drawings containing circles, arcs, and lines.

05.04 TASK: Prepare Drawings Containing Inclined and Oblique Plane Surfaces

PERFORMANCE OBJECTIVE: Given pictorial views and partially completed multi-view drawings and the drafting tools and material, complete the drawing by adding the required lines to define the inclined and oblique plane surfaces. The drawings must meet the applicable drafting standards for finished drawings.

ENABLING OBJECTIVES:

1. Identify sloped surfaces.
2. Identify all surfaces in all views.
3. Discuss true size and shape of surfaces.
4. Locate true length lines.
5. Differentiate among inclined, oblique, and normal plane surfaces.
6. Prepare drawings containing inclined and oblique plane surfaces.

05.05 TASK: Prepare Drawings Incorporating Partial Views

PERFORMANCE OBJECTIVE: Given the completed multi-view drawing and drafting equipment and material, prepare a partial view drawing. The drawings must meet applicable drafting standards for finished drawings.

ENABLING OBJECTIVES:

1. Identify parts to be given special consideration for partial views.
2. Discuss reasons for enlarging a scale if necessary.
3. Identify location marks for partial views.
4. Prepare drawings incorporating partial views.

05.06 TASK: Prepare Drawings Incorporating Removed Details and Conventional Breaks.

PERFORMANCE OBJECTIVE: Given the completed multi-view drawing and drafting equipment and material, prepare a drawing of removed details with conventional break symbols. The drawings must meet applicable standards for finished drawings.

ENABLING OBJECTIVES:

1. Identify parts to be removed for special consideration.
2. Discuss the scale used in removed details.
3. Apply the use of break symbols that meet applicable standards for the finished drawings.
4. Prepare drawings incorporating removed details and conventional breaks.

CURRICULUM GUIDE FOR DRAFTING AND DESIGN TECHNOLOGY

MODULE VI

PREPARE SECTIONAL VIEWS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE VI - PREPARE SECTIONAL VIEWS

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PREPARE SECTIONAL VIEWS

06.01 TASK: Prepare Drawings Containing Full or Half Sectional Views

PERFORMANCE OBJECTIVE: Given a set of parameters and the necessary drafting equipment and supplies, prepare orthographic views of objects that require either full or half sections. The drawings must meet applicable drafting standards for finished drawings including proper dimensioning.

ENABLING OBJECTIVES:

1. Explain the purpose of a sectional view.
2. Describe the procedures for drawing a full or half section.
3. Interpret drawings to determine required sectional views.
4. Apply dimensioning to sectional views.
5. Prepare sectional views.
6. Evaluate drawings with sectional views for accuracy.

06.02 TASK: Prepare Drawings Containing Offset Sectional Views

PERFORMANCE OBJECTIVE: Given a set of parameters and the necessary drafting equipment and supplies, prepare orthographic views of offset sections. All appropriate drafting conventions must be followed. The drawings must meet applicable drafting standards for finished drawings including proper dimensioning.

ENABLING OBJECTIVES:

1. Explain the purpose of an offset sectional view.
2. Describe the procedure for drawing an offset sectional view.
3. Interpret drawings to determine the required offset sectional views.
4. Apply dimensioning to an offset sectional view.
5. Prepare drawings containing offset sectional views.
6. Evaluate drawings with offset sectional views for accuracy.

06.03 TASK: Prepare Drawings Containing Revolved Sectional Views

PERFORMANCE OBJECTIVE: Given a set of parameters and the necessary drafting equipment and supplies, prepare drawings containing revolved sections. The drawings must meet all applicable drafting standards for finished drawings including proper dimensioning.

ENABLING OBJECTIVES:

1. Explain the purpose of a revolved section.
2. Describe the procedure for drawing a revolved section.
3. Interpret drawings to determine the required sectional views.
4. Apply dimensioning to a revolved section.
5. Prepare drawings containing revolved sections.
6. Evaluate drawings of revolved sections for accuracy.

06.04 TASK: Prepare Drawings Containing Removed or Broken-Out Sectional Views

PERFORMANCE OBJECTIVE: Given a set of parameters and the necessary drafting equipment and supplies, prepare drawings containing removed or broken-out sectional views. The drawings must meet applicable drafting standards for finished drawings including proper dimensioning.

ENABLING OBJECTIVES:

1. Explain the purpose of removed or broken-out sectional views.
2. Describe the procedure for drawing removed or broken-out sectional views.
3. Interpret drawings to determine what sectional views are required.
4. Apply dimensioning to removed or broken-out sectional views.
5. Prepare drawings containing removed sections or broken-out sectional views.
6. Evaluate drawings of removed or broken-out sectional views for accuracy.

06.05 TASK: Prepare Sectional Assembly Drawings Applying Material Symbology

PERFORMANCE OBJECTIVE: Given a set of parameters, the necessary drafting equipment and supplies, produce assembly drawings incorporating full or partial sections. Sectional views must incorporate the appropriate section-lining symbology to identify various materials. The drawings must meet applicable drafting standards for finished assembly drawings.

ENABLING OBJECTIVES:

1. Explain the purpose for drawing assembly views in section.
2. Describe the procedure for drawing assembly views in section.
3. Interpret assembly drawings to determine the required sectional views.
4. Apply the appropriate part call-out to sectioned assembly views.
5. Prepare sectional assembly drawings applying material symbols.
6. Evaluate sectional-assembly drawings for accuracy.

CURRICULUM GUIDE FOR

DRAFTING AND DESIGN TECHNOLOGY

MODULE VII

PREPARE AUXILIARY VIEWS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE VII - PREPARE AUXILIARY VIEWS

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PREPARE AUXILIARY VIEWS

07.01 TASK: Prepare Drawings Containing Auxiliary Views

PERFORMANCE OBJECTIVE: Given orthographic multi-view drawings of an object having inclined planes, all necessary drafting equipment and materials, determine the angular projection from the edge view of the incline and draw auxiliary views to accepted industry standards.

ENABLING OBJECTIVES:

1. Explain the purpose of an auxiliary view.
2. Describe the procedure for developing an auxiliary view from a normal edge view of an inclined plane.
3. Explain the relationship of a primary auxiliary view to a secondary auxiliary view.
4. Explain auxiliary projection methods.
5. Prepare drawings containing auxiliary views.

07.02 Prepare Drawings Containing Auxiliary Views That Include Curved Lines

PERFORMANCE OBJECTIVE: Given orthographic multi-view drawings of an object having inclined planes with curved lines, and all necessary drafting equipment and materials, determine the angular projection from the edge view of the incline and draw auxiliary views to accepted industry standards.

ENABLING OBJECTIVES:

1. Explain the purpose of an auxiliary view.
2. Describe procedure for developing an auxiliary view from a normal edge view of an inclined plane.
3. Explain the procedures for projecting curved features on an inclined plane from a normal view to an auxiliary plane.
4. Explain auxiliary projection methods.
5. Prepare drawings containing auxiliary views that include curved lines.

07.03 Prepare Drawings Containing Auxiliary Sections

PERFORMANCE OBJECTIVE: Given orthographic multi-view drawings of an object having inclined internal features, and all necessary drafting equipment and materials, determine a section cutting plane in the edge view of the inclined feature and draw auxiliary sections. The resulting drawings should reflect conventional standard symbols for section lining.

ENABLING OBJECTIVES:

1. Explain the purpose of an auxiliary section.
2. Describe the procedures for developing an auxiliary section.

3. Explain exclusions of any features not pertaining to auxiliary plane.
4. Explain auxiliary projection methods.
5. Prepare drawings containing auxiliary sections.

07.04 TASK: Prepare Drawings Containing Secondary Auxiliary Views

PERFORMANCE OBJECTIVE: Given orthographic multi-view drawings of an object having oblique planes, all necessary drafting equipment and materials, prepare drawings for primary and secondary auxiliary views to accepted industry standards.

ENABLING OBJECTIVES:
1. Explain the procedures for developing primary and secondary auxiliary views in sequence.
2. Explain the methods to develop a secondary auxiliary view.
3. Explain what features would be eliminated beyond the secondary auxiliary plane.
4. Describe sequential procedures to develop a secondary auxiliary view.
5. Prepare drawings containing a secondary auxiliary view.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE VIII

APPLY BASIC DIMENSIONING

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE VIII - APPLY BASIC DIMENSIONING

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APPLY BASIC DIMENSIONING

08.01 TASK: Prepare Drawings Containing Linear Dimensions and Notes

PERFORMANCE OBJECTIVE: Given orthographic views and the necessary equipment and materials, prepare drawings with applicable linear dimensions using industry standards.

ENABLING OBJECTIVES:

1. Explain purpose of dimensions.
2. Explain placement of dimensions.
3. Explain size and location dimensions.
4. Describe procedures and methods of aligned and unidirectional dimensioning.
5. Explain limit dimensions and tolerances.
6. Describe industry standards.
7. Apply arrowheads, line weight, extensions, and dimension lines.
8. Apply notations, symbols and supporting notes pertaining to dimensioning.
9. Evaluate all drawings to avoid unnecessary dimensions.
10. Prepare drawings containing linear dimensions and notes.

08.02 TASK: Prepare Drawings That Include Angular Dimensions

PERFORMANCE OBJECTIVE: Given orthographic views and the necessary equipment and materials, prepare drawings with applicable angular dimensions using industry standards.

ENABLING OBJECTIVES:

1. Explain purpose of dimensions.
2. Explain placement of dimensions for angular orientation.
3. Define degree dimensioning and point-coordinate dimensioning of an angular feature.
4. Formulate notations to define angular features other than by dimensions.
5. Demonstrate mathematical calculations to verify angular dimensions.
6. Prepare drawings that include angular dimensions.

08.03 TASK: Prepare Drawings That Include Circular Dimensions

PERFORMANCE OBJECTIVE: Given orthographic views and the necessary equipment and materials, prepare drawings with location and size dimensions of circular or partially circular features to acceptable industry standards.

ENABLING OBJECTIVES:

1. Distinguish between arc and circle designations.
2. Demonstrate discriminatory application between radius and diameter dimensions.
3. Determine proper dimension placement to assure clarity.

4. Apply dimensions to determine diameter and length of cylindrical pieces on the same view.
5. Differentiate between dimensioning techniques of positive and negative cylinders.
6. Prepare drawings that include circular dimensions.

08.04 TASK: Prepare Drawings Using Metric Dimensions

PERFORMANCE OBJECTIVE: Given an orthographic sketch with dimensions, a metric scale and all necessary drafting equipment and material, prepare orthographic drawings using the metric scale. The drawings must comply with acceptable industry standards.

ENABLING OBJECTIVES:

1. Explain the metric system, its origin and present use relative to drafting in the United States.
2. Convert between inch measurements to equivalent metric measurements.
3. Explain dual dimensioning.
4. Apply dual dimensioning techniques.
5. Compare the distinguishing characteristics of a decimal metric and an inch fractional scale.
6. Demonstrate proper use and application of the metric scale.
7. Discuss ratio scale.
8. Prepare drawings using metric dimensions.

08.05 TASK: Prepare Drawings Using Surface Characteristic Notations

PERFORMANCE OBJECTIVE: Given an orthographic drawing and the necessary drafting equipment and material, prepare drawings using the desired surface symbol(s) and define the surface(s)to drawings according to acceptable industry standards.

ENABLING OBJECTIVES:

1. Explain microinch.
2. Describe nominal and measured profile.
3. List surface characteristics.
4. Explain where data are placed on the surface symbol.
5. Determine where to attach the surface symbol (finish mark).
6. Explain ratings of surface characteristics.
7. Explain lay operations and symbols employed in defining the surface and its surface finish.
8. Prepare drawings using surface characteristic notations.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE IX
PREPARE PICTORIAL DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE IX - PREPARE PICTORIAL DRAWINGS

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PREPARE PICTORIAL DRAWINGS

09.01 TASK: Prepare Isometric Drawings

PERFORMANCE OBJECTIVE: Given multi-view drawings having straight and curved lines, tools and material, develop isometric drawings. The drawings must meet industry standards.

ENABLING OBJECTIVES:

1. Describe isometric projection.
2. Describe the purpose of an isometric drawings.
3. Differentiate between isometric projection and isometric drawing.
4. Locate variable positions of the isometric axis when viewing the object from different vantage points.
5. Identify non-isometric lines.
6. Demonstrate use of isometric template for circular features and regular curves.
7. Plot irregular curves in isometric.
8. Describe the procedure for preparing isometric drawings.
9. Prepare isometric drawings.

09.02 TASK: Prepare Diametric Drawings

PERFORMANCE OBJECTIVE: Given multi-view drawings of an object having straight and curved lines, tools and materials, develop diametric drawings. The drawings must meet industry standards.

ENABLING OBJECTIVES:
1. Describe diametric projection.
2. Describe the purpose of diametric projection drawings.
3. Explain pre-shortened receding line lengths and the use of scales.
4. Demonstrate use of diametric templates to draw circles and arcs.
5. Describe the procedure for preparing diametric drawings.
6. Prepare diametric drawings.

09.03 TASK: Prepare Cavalier Drawings

PERFORMANCE OBJECTIVE: Given multi-view drawings of an object having straight and curved lines, tools and materials, develop cavalier drawings. The drawings must meet industry standards.

ENABLING OBJECTIVES:
1. Describe cavalier drawings.
2. Describe the purpose of cavalier drawings.

3. Explain cavalier projection.
4. Demonstrate the use of scale for cavalier drawings.
5. Differentiate between cavalier and isometric drawings.
6. Describe the procedure for preparing cavalier drawings.
6. Prepare cavalier drawings.

09.04 TASK: Prepare Cabinet Drawings

PERFORMANCE OBJECTIVE: Given orthographic drawings of a suitable object, materials and tools, develop cabinet drawings. The drawings must meet industry standards.

ENABLING OBJECTIVES:

1. Describe cabinet drawings.
2. Describe the purpose of cabinet drawings.
3. Differentiate among cabinet, cavalier, and general oblique drawings.
4. Demonstrate use of scale for cabinet drawings.
5. Describe the procedure for preparing cabinet drawings.
6. Prepare cabinet drawings.

09.05 Prepare Perspective Drawings

PERFORMANCE OBJECTIVE: Given top, front and a side view of an object, materials and tools, develop perspective drawings. The drawings must meet industry standards.

ENABLING OBJECTIVES:

1. Describe perspective drawings.
2. Describe the purpose of perspective drawings.
3. Define terms associated with perspective drawings.
4. Describe the procedure for preparing perspective drawings.
5. Prepare perspective drawings.

CURRICULUM GUIDE FOR DRAFTING AND DESIGN TECHNOLOGY

MODULE X

PREPARE SHEET METAL DEVELOPMENTS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE X - PREPARE SHEET METAL DEVELOPMENTS

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PREPARE SHEET METAL DEVELOPMENTS

10.01 TASK: Prepare Sheetmetal Development Drawings

PERFORMANCE OBJECTIVE: Given a multi-view drawing of a thin-walled object, drafting material and tools, prepare sheetmetal development drawings. The drawings must meet industry standards.

ENABLING OBJECTIVES:

1. Describe sheetmetal development drawings.
2. Describe the purpose of sheetmetal development drawings.
3. Define terms associated with sheetmetal development drawings.
4. Describe the procedure for the layout of a transition piece.
5. Describe the procedure of determining the line of intersection between objects.
6. Prepare sheetmetal development drawings.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE XI

UTILIZE DRAFTING APPLICATIONS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XI - UTILIZE DRAFTING APPLICATIONS

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UTILIZE DRAFTING APPLICATIONS

11.01 TASK: Use Drafting and Graphic Appliques

PERFORMANCE OBJECTIVE: Given reference materials, necessary equipment drawing and applique materials, transfer appliques to drawings.

ENABLING OBJECTIVES:
1. Explain the purpose of appliques.
2. Define terms associated with appliques.
3. Explain the difference between sticky back and rub-on transfers.
4. Distinguish between hand-drawn and commercial appliques.
5. Apply appliques to drawings.

11.02 TASK: Use Cut and Paste Techniques

PERFORMANCE OBJECTIVE: Given reference materials and equipment, use cut and paste techniques to modify drawings.

ENABLING OBJECTIVES:
1. Follow proper safety procedures.
2. Define terms associated with cut and paste techniques.
3. List tools used with cut and paste procedures.
4. Describe cutting and taping techniques.
5. Perform cut and paste operation.

11.03 TASK: Identify Photo Techniques

PERFORMANCE OBJECTIVE: Given the necessary equipment and materials, identify photo techniques.

ENABLING OBJECTIVES:
1. Define terms associated with photocopy processes.
2. Discuss the importance of photocopy quality.
3. Explain the benefits of microfilm.
4. Describe the procedures of storing and caring for photocopy material.

11.04 TASK: Prepare Overlay Drawings

PERFORMANCE OBJECTIVE: Given a freehand sketch, specifications, reference materials, and the necessary equipment, prepare overlay drawings.

ENABLING OBJECTIVES:
1. List methods of preparing overlay drawings.
2. Define terms associated with overlay drawings.

3. Identify types of overlay material.
4. Describe procedures for preparing overlay drawings.
5. Prepare overlay drawings.

11.05 TASK: Make Drawing Changes on Reproducible Drawings

PERFORMANCE OBJECTIVES: Given reproducible drawings, materials to make the corrections, necessary drafting equipment, make corrections on reproducible drawings.

ENABLING OBJECTIVES:
1. List material used with reproducible drawings.
2. Define terms associated with reproducible drawings.
3. Explain the purpose of a reproducible drawings.
4. Discuss the importance of recording changes made to reproducible drawings.
5. Explain the purpose of a reverse reproducible drawings.
6. Describe procedures for preparing reproducible drawings.
7. Make corrections on reproducible drawings.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE XII

PREPARE BASIC CHARTS AND GRAPHS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XII - PREPARE BASIC CHARTS AND GRAPHS

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PREPARE BASIC CHARTS AND GRAPHS

12.01 TASK: Prepare Bar, Pie, and Flow Charts

PERFORMANCE OBJECTIVE: Using available tools, analyze and interpret information provided to generate appropriate bar, pie and/or flow charts according to appropriate drafting standards for finished drawings.

ENABLING OBJECTIVES:

1. Identify basic classifications of graphs and what types of comparative information they describe.
2. Explain why graphs are important and pertinent to the occupation of drafter.
3. Perform the basic layout functions of the bar, pie and flow chart.
4. Solve mathematical situation (story) problems involving percentages and apply them to bar and pie charts.
5. Analyze a process and prepare corresponding flow charts.

12.02 TASK: Prepare Rectangular and Semi-Logarithmic Graphs

PERFORMANCE OBJECTIVE: Analyze data provided, interpret the information and graphically illustrate the conclusions in both rectangular coordinate and semi-logarithmic format to determine real or falsely indicated trends by rate of change analysis.

ENABLING OBJECTIVES:

1. Describe the differences between rectangular coordinate graphs and semi-logarithmic graphs.
2. Describe how the semi-logarithmic graph may more accurately define trends.
3. Define "rate of change" and how it relates to a semi-logarithmic graph and its rectangular coordinate counterpart.
4. Prepare rectangular coordinate graphs and the corresponding semi-logarithmic graphs.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE XIII

PERFORM BASIC COMPUTER SKILLS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XIII - PERFORM BASIC COMPUTER SKILLS

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13.01 TASK: Use a Full Size Standard Keyboard

PERFORMANCE OBJECTIVE: Demonstrate familiarity with key locations and functions of the microcomputer keyboard.

ENABLING OBJECTIVES:

1. Identify key locations for alphanumeric characters and how they compare to the typewriter keyboard.
2. Describe the purpose of keys not typically seen on the conventional typewriter.
3. Enter text and alphanumeric data on a computer using conventional keyboarding skills.

13.02 TASK: Use a Monitor

PERFORMANCE OBJECTIVE: Compare different types of monitors and graphics adapters, describe the function and safe use of the monitor in the microcomputer system, and demonstrate a familiarity with brightness and contrast controls.

ENABLING OBJECTIVES:

1. Describe the comparative uses and resolutions of monochrome and color monitors.
2. Compare text mode and graphics mode usage.
3. Identify control locations on a monitor.
4. Adjust the brightness and contrast controls on a monitor and position the monitor.
5. Discuss the effects of the monitor screen on the eyes and the potential radiation effects from the rear of the monitor.

13.03 TASK: Use a Disk Operating System

PERFORMANCE OBJECTIVE: Demonstrate proper file management techniques, utilizing paths, filenames and extensions, wildcard characters and basic internal and external commands.

ENABLING OBJECTIVES:

1. Describe the function of the disk operating system for a microcomputer including the booting procedure.
2. Identify storage media devices.
3. Boot a computer.
4. Format a data disk.
5. Demonstrate file management techniques.
6. Determine available space on a disk.
8. Define DOS (or applicable system) terms and command syntax.
9. Compare internal and external operating system commands.

13.04 TASK: Use a Dual Disk Drive Microcomputer

PERFORMANCE OBJECTIVE: Load and use floppy disk software (including DOS) properly in a microcomputer without a hard disk.

ENABLING OBJECTIVES:

1. Explain the booting procedure for a dual floppy disk drive microcomputer, including the use of bootable or system disks, and non-booting disks.
2. Boot a computer using a bootable (DOS) disk.
3. Reboot the computer using a bootable software program disk.
4. Execute a software program where disk exchange must occur periodically and describe why the exchange occurs.
5. Save a file to a data disk.
6. Demonstrate the ability to retrieve saved data files.
7. Execute a software program that is not on a bootable disk.
8. Demonstrate proper use and storage of the 5.25" and 3.5" floppy disk.
9. List the various floppy disk sizes, capacities and their respective compatibility.
10. Shut the system down properly.

13.05 TASK: Use a Hard Disk

PERFORMANCE OBJECTIVE: Demonstrate the ability to identify hard disk directory structure, paths, perform file management, organization maintenance and backup procedures.

ENABLING OBJECTIVES:

1. Illustrate a hard disk directory structure to describe use of disk operating system to manage files within the structure as well as transfer of files to other storage devices.
2. Develop a file management strategy.
3. Describe the importance of hard disk backup procedures.
4. Describe the boot procedure for a microcomputer with a hard disk.
5. Perform file management techniques.

13.06 TASK: Demonstrate a Knowledge of Commands Required to Operate a Specific Computer Software Program

PERFORMANCE OBJECTIVE: Following a demonstration of software program start-up, load, start and exit a software program.

ENABLING OBJECTIVES:

1. Describe the indicated intent of .COM, .EXE and .BAT files.
2. Locate executable files for a software program on a microcomputer system.
3. Execute the program by entering the appropriate executable filename at the system prompt.
4. Install a software program on a hard disk system.
5. Exit a software program following proper procedures.

13.07 TASK: Use a Translation Utility Format

PERFORMANCE OBJECTIVE: Following a presentation of correct conversion procedures, translate a CAD drawing file from one software package to another using any compatible format and analyze the converted drawing for any loss of or misinterpretation of data.

ENABLING OBJECTIVES:
1. Discuss the intent and value of drawing exchange and translation formats.
2. Save a drawing in a translation format.
3. Import the exchange file according to instructions and evaluate the results.

CURRICULUM GUIDE FOR

DRAFTING AND DESIGN TECHNOLOGY

MODULE XIV

PREPARE BASIC COMPUTER AIDED DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XIV - PREPARE BASIC COMPUTER AIDED DRAWINGS

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PREPARE BASIC COMPUTER AIDED DRAWINGS

14.01 TASK: Select the Proper Drawing Scale

PERFORMANCE OBJECTIVE: Given a computer, supporting CAD software, and drawing specifications, select the scale that best meets the needs of the drawing.

ENABLING OBJECTIVES:
1. Determine final plot scale.
2. Determine drawing sheet size.
3. Describe the procedure to determine drawing units.
4. Describe the procedure to determine plotting limits.

14.02 TASK: Use a Digitizer

PERFORMANCE OBJECTIVE: Given a computer having drafting software loaded, a monitor, and a digitizer, draw objects on the screen using a digitizer as an input device.

ENABLING OBJECTIVES:
1. Describe the procedure to utilize a digitizer.
2. Define terms associated the operation of a digitizer.
3. Set up a drawing surface on the computer.
4. Describe the procedure to configure a digitizer.
5. Describe the use of third party software and templates.
6. Prepare a drawing using a digitizer.

14.03 TASK: Produce Multi-view Drawings with Dimensions

PERFORMANCE OBJECTIVE: Given a computer and supporting CAD software, and preliminary sketches, prepare multi-view drawings with dimensions to acceptable industry standards.

ENABLING OBJECTIVES:
1. Define terms associated with multi-view drawing with dimensioning.
2. Describe the procedures for setting up drawing layers.
3. Describe the procedures setting dimensioning variables.
4. Demonstrate use of dimensioning features of the CAD program.
5. Prepare multi-view drawings with dimensions.

14.04 TASK: Produce Sectional View Drawings With Dimensions

PERFORMANCE OBJECTIVE: Given a computer, supporting CAD software, and preliminary sketches, prepare sectional view drawings with dimensions to acceptable industry standards.

ENABLING OBJECTIVES:
1. Define terms associated with sectional view drawings with dimensioning.
2. List the different types of sectional views.
3. Describe the procedures for setting up drawing layers.
4. Describe the procedures for setting dimensioning variables.
5. Demonstrate methods for hatching sectioned areas.
6. Prepare sectional view drawings with dimensions.

14.05 TASK: Produce Auxiliary View Drawings With Dimensions

PERFORMANCE OBJECTIVE: Given a computer, supporting CAD software, and preliminary sketches, prepare multi-view drawings with dimensions to acceptable industry standards.

ENABLING OBJECTIVES:
1. Define terms associated with auxiliary view drawings with dimensions.
2. List the different types of auxiliary drawings.
3. Describe the procedures for setting up drawing layers.
4. Describe the procedures for setting dimensioning variables.
5. Prepare auxiliary view drawings with dimensions.

14.06 TASK: Produce Pictorial Drawings

PERFORMANCE OBJECTIVE: Given a computer, supporting CAD software, and preliminary sketches, prepare pictorial drawings to applicable industry standards.

ENABLING OBJECTIVES:
1. Define terms associated with pictorial drawings.
2. List the different types of auxiliary drawings.
3. Describe the procedures for setting up drawing layers.
4. Describe the procedures for setting dimensioning variables.
5. Produce pictorial drawings.

14.07 TASK: Produce Charts and Graphs

PERFORMANCE OBJECTIVE: Given a computer, supporting CAD software and data to be charted and graphed, produce charts and graphs.

ENABLING OBJECTIVES:
1. Define terms associated charts and graphs.

2. Produce three types charts or graphs using the same data.
3. Select the type of graph or chart which best illustrates data.

14.08 TASK: Use a Plotter

PERFORMANCE OBJECTIVE: Given a computer, supporting CAD software, CAD drawing, and plotter, plot a drawing.

ENABLING OBJECTIVES:
1. Define terms associated with plotters.
2. Describe the procedure to configure a plotter.
3. Set up a plotter.
4. Describe the procedure to plot a drawing.
5. Plot a drawing.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE XV

PREPARE BASIC ARCHITECTURAL DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XV - PREPARE BASIC ARCHITECTURAL DRAWINGS

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PREPARE BASIC ARCHITECTURAL DRAWINGS

15.01 TASK: Interpret vendor's catalogs, technical tables and building codes.

PERFORMANCE OBJECTIVE: Given a copy of FHA minimum property standards, a set of Sweet's catalogs, a current copy of an appropriate model building code, specifications, zoning, ordinances, and sketches for residential structures, select appropriate information necessary to prepare a complete drawing set.

ENABLING OBJECTIVES:
1. Explain the purpose of minimum property standards, building codes, and zoning ordinances.
2. Identify elements of residential construction controlled by codes and ordinances.
3. Reference and explain applicable specifications and codes.
4. Explain the purpose of specific specification forms.
5. Select appropriate items from vendor's catalogs using tables and other technical information provided.

15.02 TASK: Prepare Floor Plan Drawings With Dimensions

PERFORMANCE OBJECTIVE: Given vendor's catalogs, technical tables, building codes, appropriate reference information, specifications and sketches, necessary drafting equipment and materials, prepare floor plan drawings with dimensions. The drawings must include installed equipment and fixtures and meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Explain the rules for dimensioning architectural drawings.
2. Explain the importance of the Architectural Graphic Standards and the Time-Saver Standards.
3. Identify factors that contribute to a well balanced drawing.
4. Demonstrate a professional style of architectural lettering.
5. Discuss the scales generally used to draw floor plans and explain typical applications of each example.
6. Sketch a kitchen with an adequate work triangle and room size.
7. Determine adequate room sizes, storage areas, closets, windows, doors and logical traffic flow to meet specification and occupancy needs.
8. Identify common symbols used in a floor plan.
9. Prepare floor plan drawings with dimensions.

15.03 TASK: Prepare Foundation Plan and Detail Drawings With Dimensions

PERFORMANCE OBJECTIVE: Given a sketch of a foundation plan, sub-grade bearing capacity, specifications, reference materials, and the necessary drafting equipment and materials, prepare a foundation plan. The drawings must include installed equipment and fixtures and meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Identify the common elements of a foundation plan.
2. Explain considerations for the size and type of footing.

3. Identify advantages and disadvantages of slab and crawl space foundations.
4. Define live load and dead load.
5. Describe the procedures for drawing a foundation plan.
6. Reference applicable specifications and building code(s).
7. Prepare a foundation plan and detail drawings with dimensions.

15.04 TASK: Prepare Elevation Drawings With Dimensions

PERFORMANCE OBJECTIVE: Given interior and exterior elevation sketches, specifications, reference materials, and the necessary drafting equipment and materials, prepare elevation drawings with dimensions. The drawings must include installed equipment and fixtures and meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Explain how mass, material and color affect the appearance of residential structures and elevations.
2. Identify interior and exterior elevation symbols.
3. Identify interior walls that are commonly shown in elevation drawings.
4. Describe the procedure for drawing an interior elevation.
5. Describe the procedure for drawing an exterior elevation.
6. Reference applicable specifications and building code(s).
7. Prepare elevation drawings with dimensions.

15.05 TASK: Prepare Section Drawings With Dimensions

PERFORMANCE OBJECTIVE: Given section drawing sketches, specifications, reference materials, and the necessary drafting equipment and materials, prepare section drawings with dimensions. The drawings must include installed equipment and fixtures and meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Explain the purpose of section drawings.
2. Identify common symbols used for section drawings.
3. Identify applications of sections and details.
4. Describe the procedure for drawing sections.
5. Identify proper cross-referencing procedures.
6. Reference applicable specifications and building code(s).
7. Prepare section drawings with dimensions.

15.06 TASK: Prepare Schedules

PERFORMANCE OBJECTIVE: Given residential plans, reference materials, and the necessary drafting equipment and materials, prepare door, window, and finish schedules. The drawings must include installed equipment and fixtures and meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Explain the purpose of door, window, and finish schedules.
2. Identify lettering practices and format requirements for schedules.

3. Describe the procedures for preparing door, window, and finish schedules.
4. Reference applicable specifications and building code(s).
5. Prepare schedules.

15.07 TASK: Prepare Landscape Layouts

PERFORMANCE OBJECTIVE: Given a building site plan, a sketch of a planting plan, specification, reference material, and the necessary drafting equipment and materials, prepare landscape layouts. The drawings must include installed equipment and fixtures and meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Explain the purpose of a site plan and a landscape plan.
2. Explain how to locate property lines, finish floor elevations, bench marks, utilities, and concrete structures on a site plan.
3. Describe procedures for drawing a site plan and a landscape plan.
4. Identify symbols used in drawing both site plans and landscape plans.
5. Reference applicable specifications and building codes.
6. Prepare landscape layouts.

15.08 TASK: Build Architectural Models

PERFORMANCE OBJECTIVE: Given a complete drawing set of a residence or commercial structure, and necessary tools, build a three dimensional model to scale.

ENABLING OBJECTIVES:
1. Explain the purpose of a study model and the materials typically used to construct them.
2. Explain the purpose and construction of a display model.
3. Simulate methods of constructing plants, grass, roads, sidewalks, crushed stone and figures.
4. Explain how water may be represented.
5. Discuss materials used to construct building structures.
6. Discuss the use of prepared materials.
7. Discuss model assembly and fastening techniques.
8. Build architectural models.

15.09 TASK: Prepare Truss Drawings

PERFORMANCE OBJECTIVE: Given an engineers design drawing, a section sketch, specifications, reference materials, necessary drafting equipment and materials, prepare truss drawings. The drawings must include installed equipment and fixtures and meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Discuss the purpose of an erection drawing.
2. Discuss the purpose of shop detail drawings.

3. Define terms associated with truss drawings.
4. Describe drafting methods used to detail a truss.
5. Identify fastener symbols.
6. Explain standards for calling out structural lumber and structural steel members.
7. Discuss truss configurations.
8. Prepare truss drawings.

15.10 TASK: Prepare Stairway Drawings

PERFORMANCE OBJECTIVE: Given floor elevations, a floor plan, specifications, reference materials, and the necessary drafting equipment and material, prepare stairway drawings. The drawings must include installed equipment and fixtures and meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Define the terms associated with stairway drawings.
2. Describe the procedure for laying out and detailing stairways in plan and section.
3. Explain code requirements for handrails and guardrails.
4. Describe optimum rise and run.
5. Prepare stairway drawings.

15.11 TASK: Prepare Fireplace/Chimney Drawings

PERFORMANCE OBJECTIVE: Given a fireplace sketch, specifications, reference materials and the necessary drafting equipment and materials, prepare plan, elevation and necessary section view drawings of a fireplace/chimney. The drawings must include installed equipment and fixtures and meet appropriate industry standards. The design details must be in accordance with specifications and local code requirements.

ENABLING OBJECTIVES:
1. Describe the proper proportional relationship for width, depth and height of the fire chamber.
2. Describe the proper use of fireplace/chimney building materials.
3. Describe the proper flue size in relation to the fireplace opening.
4. Determine minimum hearth extension.
5. Calculate the chimney size and height necessary.
6. Explain the appropriate building code requirements.
7. Define terms associated with fireplace/chimney drawings.
8. Explain the theory of operation and airflow in a fireplace/chimney.
9. Prepare fireplace/chimney drawings.

15.12 TASK: Prepare Plot Plan Drawings

PERFORMANCE OBJECTIVE: Given a sketch of a building plot, specifications, reference materials, and the necessary drafting equipment and materials, prepare a plot plan. The drawings must include present orientation data and meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Explain the purpose of a plot plan.
2. Explain how to locate property lines, new and existing contour lines, finish floor elevation, bench marks, utilities, and concrete structures on a plot plan.
3. Describe the procedures for drawing a plot plan.
4. Identify symbols used in drawing a plot plan.
5. Reference applicable specifications and building code(s).
6. Discuss the impact of site conditions on residential design process.
7. Prepare plot plan drawings.

15.13 TASK: Prepare Plumbing Plan Drawings

PERFORMANCE OBJECTIVE: Given plumbing sketches or specifications for a building, reference materials, and the necessary drafting equipment and materials, prepare a plumbing plan. The drawings must include installed equipment and fixtures and must be in accordance with applicable code(s) and standards.

ENABLING OBJECTIVES:
1. Explain the purpose and use of plumbing plans.
2. Identify symbols and notations used in drawing plumbing plans.
3. Describe the procedure for drawing a plumbing plan.
4. Identify plumbing systems requirements.
5. Reference applicable code(s) regarding plumbing plans and requirements.
6. Prepare plumbing plan drawings.
7. Prepare schematic drawings.

15.14 TASK: Prepare HVAC Drawings

PERFORMANCE OBJECTIVE: Given sketches or specifications for heating, ventilation, and air conditioning for a building, reference materials, and the necessary drafting equipment and materials, prepare a HVAC plan. The drawings must include installed equipment and fixtures and must be in accordance with applicable code(s) and standards.

ENABLING OBJECTIVES:
1. Explain the purpose and use of a HVAC plan.
2. Identify symbols and notations used in drawing a HVAC plan.
3. Describe the procedure for drawing a climate control and duct-work plan.

4. Reference applicable code(s) regarding HVAC systems and requirements.
5. Prepare HVAC drawings.

15.15 TASK: Prepare Electrical Plan Drawings

PERFORMANCE OBJECTIVE: Given electrical specifications for a building, reference materials, and the necessary drafting equipment and materials, prepare electrical plan drawings. The drawings must include installed equipment and fixtures and must be in accordance with applicable code(s) and standards.

ENABLING OBJECTIVES:
1. Explain the purpose and use of electrical plans.
2. Identify symbols and notations used in drawing electrical plans.
3. Describe the procedure for drawing an electrical plan.
4. Reference applicable code(s) regarding electrical systems and requirements.
5. Prepare electrical plan drawings.

RECOMMENDATION: Increase focus on vocational program/course outcomes.

DISCUSSION: Program outcomes can be interpreted to means level of performance of graduates. The preparation of students in a program is directly related to the program content and the time-on-task devoted to the topics. To be effective, programs must state in clear, precise terms the outcomes expected from students who enroll in a program. Programs which are competency-based provide this but programs based on course descriptions and teacher intuition clearly cannot.

The Division should focus on expected outcomes of programs which are stated in the form of a statewide curriculum guide. Competencies expressed through task lists compiled and validated by industry personnel serve a the major source of expected outcomes. Clearly, the outcome of a program, stated in broad terms, is industry level employment. Several levels of outcomes are natural in a continuum delivery system such as Vocational Education. Program outcomes at the secondary level should be similar to entrance expectations of a postsecondary program.

The key to addressing outcomes of a program, in student terms, is a competency profile which describes the continuum of expectations and reflects the achievement of competencies by students. Not every student will master the same number of tasks on the competency profile but a record of the accomplishments is provided for evaluating the student's abilities when determining continuation of study or potential for employment.

The Division should concentrate on developing a set of outcomes for every program offered in the state. These outcomes would be a natural extension of the task list and common curriculum guide developed with industry's assistance. Each program should have a competency profile. These profiles could be used to meet one or more of the elements in the Standards and Measures requirements of the Carl Perkins Act.

Outcomes should reflect the nature of the program; they should be different for those programs which are designed to provide introductory aspects of the workplace than for those which are intended to provide occupational or job specific skill development. Pre-Technical programs would have different expectations than would programs which fall into the Area of Concentration or Postsecondary programs. The Division should establish three exit points for students in secondary programs. These exit points would reflect their career choice and would help determine program selection. The exit points suggested are: continued education at a college or university, postsecondary occupational training, or apprenticeship entry. Students choosing occupational skill development or apprenticeship paths would be likely candidates for more concentrated Vocational Education programs, while the college-oriented could choose to enroll in selected vocational courses to supplement their academic preparation.

Workplace transition skills should be expected outcomes of all vocational programs. Workplace transitional skills are addressed in the SCANS report and are strongly supported by industry. They encompass industry-based instruction and may include Cooperative Education, shadowing, and/or apprenticeship partnerships between education and industry.

IMPLEMENTATION STEPS: The Division should begin the implementation process by developing competency profiles for all vocational programs. The profiles must be developed on the basis of an industry validated task list and must be consistent with the occupational intent of

It is proposed that task list be secured for all programs offered in the state and profiles be developed for each of these. The profiles should contain sufficient data to meet the requirements of the Carl Perkins Act for Standards and Measures and they should be the element which describes the program outcomes. These profiles should become the major component of program articulation between secondary and postsecondary programs.

The profiles would be made available to all schools through the Curriculum Dissemination Center on a cost recovery basis. They would figure intuitively into the IEP for special populations students or for any student who would benefit from a prescribed course of study.

FISCAL IMPACT:

RECOMMENDATION: Provide for program and curriculum integrity in all vocational stages of preparation.

DISCUSSION: The demands of industry for Vocational Education to provide quality graduates that meet employment expectations suggests that we need to ensure integrity throughout all programs supported by the Division. To accomplish this expectation, some form of program uniformity must be established. The common thread would have to come from the establishment and enforcement of minimum program standards and a plan to implement these standards statewide. Standards would include teacher qualifications, facilities, equipment, and related program items. It is suggested that additional components should include; curriculum content and method of delivery.

One of the major concerns of industry is that each institution prepares students differently and they cannot expect the same level of performance from students from different institutions. They feel that all program outcomes should be the same, at least for basic preparatory levels. Industry suggests that a common curriculum should be expected, that the sequence of instruction should be similar between all vocational programs which purport to teach to similar job descriptions. The answer to making certain that some semblance of course content exists between all institutions is to use the same set of tasks developed by the industry which will employ graduates from the programs. This would provide content validity.

We would also need to consider establishing standards for instructional delivery, both methodology and sequence. This speaks to instructor qualifications and standardized modules for instruction. Teacher Education would play a major role in these two activities, especially the methodology wherein they would provide instruction on applied methods for specific approaches to hands-on learning environments. Stronger emphasis on competency-based strategies would be expected, along with techniques for collaborative teaching strategies.

The SCANS report speaks to non-technical skills. We need to begin a process for providing our instructors the needed skills to teach the types of skills they have avoided teaching. Industry again has decreed these skills to be essential to successful employment. Perhaps this activity goes beyond program and curriculum integrity, but we should expect some element of the SCANS expectations to be integral to our delivery system. Program integrity is critical to two other elements of effective vocational programs, as well. Articulation efforts require accurate measurement of student progress and stability of program delivery. The same is true for apprenticeship activities. If we plan to implement effective articulation and apprenticeship paths for students, it is essential that we have program integrity.

IMPLEMENTATION STEPS: It is suggested that teacher education become directly involved in the curriculum process to assist in the implementation phase. This would require that the Division through industry contacts prepare common curriculum material and, with the assistance of teacher education, determine what standards should be implemented. Teacher education would be more directly involved in the methodology and non-technical elements but would take an active role in determining instructional sequence and, to a point, content.

Step one in this process is to identify the program standards acceptable for each instructional program and determine common elements for each. Instructional content would be secondary at this point with the emphasis being placed on process components, ie: program organization, The second phase would be to conduct regional workshops for all instructors to provide skills which would enable them to organize their programs around the standards and prepare competency-based opportunities for students. It would be necessary to require that all instructors participate in the workshops to provide some element of quality control within the instructional component of the program. Perhaps, we would approve program operation on the basis of attendance and satisfactory completion of these instructor upgrading workshops.

Programs which have gone through recent statewide curriculum revision would utilize the revised guides in the standards development process. Those which are slated for revision would implemented in phases but a procedure for revision of curriculum would be implemented which would ensure completion of the revision process in a minimum of three years. Industry concerns for quality control would be addressed through a procedure of program restructuring and alignment. The element of consistency of instruction would be, likewise addressed through workshops involving instruction in teaching methods, laboratory organization, collaborative techniques, and industry interaction.

Consideration would also be given to implementing a statewide testing process, or at least a universal testing process. Industry has suggested this approach and have volunteered to assist in the development of test items or testing procedures. This would address quality control of programs from an outcome standpoint. Membership in consortia which possess these testing elements would seem to be a natural step. VTECS, NOCTI, and others would be considered, with VTECS being the most appropriate for Trades and Industry, Agriculture, Business, and Technology because of the extensive development work undertaken in those areas. VTECS also has material for other disciplines, but T&I is the most prominent program in postsecondary institutions.

FISCAL IMPACT:

CURRICULUM GUIDE FOR

DRAFTING AND DESIGN TECHNOLOGY

MODULE XVI

PREPARE BASIC STRUCTURAL DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XVI - PREPARE BASIC STRUCTURAL DRAWINGS

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PREPARE BASIC STRUCTURAL DRAWINGS

16.01 TASK: Use Structural Member and Reinforcing Concrete Manuals and Technical Tables

PERFORMANCE OBJECTS: Given structural plans, specifications, AISC manual, ACI handbook or other national level standards, demonstrated the use of structural member and reinforcing concrete manuals and technical tables to professional proficiency standards.

ENABLING OBJECTIVES:

1. Identify structural steel or wood shapes.
2. Identify reinforcing concrete bar sizes and bend types.
3. Explain the purpose of reinforcement in concrete.
4. Identify the different types of steel structures.
5 Interpret construction drawings and describe the architectural format.
6. Solve algebraic calculations.
7. List abbreviations and define usage.

16.02 TASK: Detail Structural Beam Connections

PERFORMANCE OBJECTIVE: Given a partial or full set of structural drawings with specifications, AISC manual, or other national-level standards and necessary drafting equipment and materials, draw structural beam connections to industry standard format.

ENABLING OBJECTIVES:

1. Reference AISC standards regarding beam connections.
2. Identify the types of beam connections from tables.
3. Calculate block shear.
4. Calculate beam blocking.
5. Examine and determine beam cuts from manuals.
6. Illustrate fastener dimensioning practices.
7. Calculate column web shear and bearing.
8. Calculate weld shear and bearing.
9. Calculate welded web shear.
10. Label beam shipping and placement marks.
11. Prepare structural beam connections drawing.

16.03 TASK: Detail Concrete Reinforcements

PERFORMANCE OBJECTIVE: Given a partial or full set of structural plans, specifications, ACI manual, or other national-level standards, and the necessary drafting equipment and materials, draw reinforcing concrete placement details to industry standard format.

ENABLING OBJECTIVES:

1. Explain the purpose of a detailed reinforcing concrete plan.
2. Explain which views are necessary for a reinforced concrete placement plan.

3. Describe the procedure for the developmental strength of reinforcement in a concrete placing plan.
4. Explain ACI placement plan layout and detail practices.
5. Prepare reinforced steel cut and bend schedule.
6. Locate and determine individual bar lengths and/or bends.
7. Choose the correct bend type for bent bar application.
8. Describe a pre-cast concrete structure.
9. Describe a monolithic reinforced concrete structure.
10. Prepare detail concrete reinforcement drawings.

16.04 TASK: Prepare Material Take Off List

PERFORMANCE OBJECTIVE: Given a set of structural shop drawings, specifications, AISC manual or other national-level standards and the necessary drafting equipment, and materials, prepare a materials takeoff list to industry standard format.

ENABLING OBJECTIVES:
1. Identify the parts of a materials list.
2. Explain the purpose of a material list.
3 Describe the procedure for preparing a material list.
4. Identify format-rules for spacing, order of listing items, listing purchased and ship items.
5. Prepare material take off list.

16.05 TASK: Draw Framing Plans and Elevations

PERFORMANCE OBJECTIVE: Given a set of architectural plans or sketches, specifications and a description of the materials, AISC manual or other national-level standards, and the necessary drafting equipment and materials, draw structural framing plans and elevations to industry standard format.

ENABLING OBJECTIVES:
1. Define a framing plan and describe its elements.
2. Identify views and details necessary for the framing plan.
3. Follow and use AISC manual and other standards regarding a framing plan.
4. Describe the procedure for drawing a framing plan.
5. Define the terms applying to a framing plan.
6. Calculate materials stresses as they apply to bolts, weldments, and materials.
7. Identify the standard structural shapes.
8. Explain the importance of standard abbreviations and order of specification as referenced in ACI, AISC, Pre-Cast Concrete Institute and N.W. Timber Association.
9. Prepare drawings of framing plans and elevations.

16.06 TASK: Identify Welding Symbols

PERFORMANCE OBJECTIVE: Given a set of steel-detail drawing or a sketch, AWS or other national-level standards, identify the welding symbols. The symbols must meet all requirements as they apply to piping, structural shapes, machine parts, appearance, notations, and accuracy.

ENABLING OBJECTIVES:

1. **Identify fields of engineering where weldment applies.**
2. **Identify types of materials used in welding.**
3. **Explain one method of materials identification.**
4. **Explain strengths of base materials.**
5. **Explain strengths of welding materials.**
6. **Explain welding positions and purposes.**
7. **Explain types of welding.**
8. **Explain procedures, uses and methods of different types of welding.**

CURRICULUM GUIDE FOR

DRAFTING AND DESIGN TECHNOLOGY

MODULE XVII

PREPARE BASIC CIVIL DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XVII - PREPARE BASIC CIVIL DRAWINGS

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PREPARE BASIC CIVIL DRAWINGS

17.01 TASK: Interpret Technical Standards for Soils and Construction Materials

PERFORMANCE OBJECTIVE: Given reference materials, soil profile, notes, data and necessary equipment calculate a mass diagram to accepted industry standards.

ENABLING OBJECTIVES:

1. Define terms associated with soils and construction material.
2. Discuss procedures for preparing soil for construction.
3. Explain the importance of determining load-bearing capacity of soil.
4. Interpret a soil profile.

17.02 TASK: Prepare Topographic Drawings

PERFORMANCE OBJECTIVES: Given surveyor's notes, geographical specifications, reference materials, and the necessary drafting equipment and materials, draw a topographical map to accepted industry standards.

ENABLING OBJECTIVES:

1. Explain the purpose of a topographical map.
2. Describe the information needed for drawing a topographical map.
3. Explain the principles involved in placing contour lines.
4. Identify various land features indicated by contour lines.
5. Identify cultural symbols used in drawing topographical maps.
6. Explain the principles of latitude and longitude.
7. Solve mathematical problems involving civil measurements.
8. Describe the procedure for running elevations with a level.
9. Explain the importance of notes in running elevations.
10. Prepare topographical drawings.

17.03 TASK: Prepare Drainage Drawings

PERFORMANCE OBJECTIVES: Given a complete description of a parcel of land, reference material and the necessary drafting equipment and materials prepare drainage drawings to accepted industry standards.

ENABLING OBJECTIVES:

1. Define time associated with drainage drawings.
2. Describe types of drainage lines.
3. Prepare drainage drawings.
4. Define the different types of drainage lines.
5. Prepare drainage drawings.

17.04 TASK: Prepare Plan and Profile Drawings

PERFORMANCE OBJECTIVES: Given notes, reference points, land specifications, reference materials, and the necessary equipment and materials, prepare plan and profile drawings to accepted industry standards.

ENABLING OBJECTIVES:

1. Discuss the purpose of plan and profile drawings.
2. Explain relative scale and layout between plan and profile.
3. Interpret survey notes and engineering data for plan and profile.
4. Prepare plan and profile drawings.

17.05 TASK: Prepare Traverse Drawings

PERFORMANCE OBJECTIVES: Given reference materials, survey notes, and equipment, prepare traverse drawings to accepted industry standards.

ENABLING OBJECTIVES:

1. Define terms associated with traverse drawings.
2. Convert azimuths and interior angles to bearings.
3. Explain the importance of accurate notes.
4. Calculate acreage of identified plots of land.
5. Define azimuth terms.
6. Describe procedures for preparing traverse drawings.
7. Prepare traverse drawings.

17.06 TASK: Prepare Plat Drawings

PERFORMANCE OBJECTIVES: Given a complete description of a parcel of land, reference materials, and the necessary drafting equipment and materials, prepare plat drawings to accepted industry standards.

ENABLING OBJECTIVES:

1. Identify the parts of a survey plat.
2. Identify the symbols and notations used on a survey plat legend.
3. Define terms associated with plat drawings.
4. Describe the procedure for drawing a survey plat.
5. Prepare plat drawings.

17.07 TASK: Prepare Street Layout Drawings

PERFORMANCE OBJECTIVES: Given a complete description of a parcel of land, reference material and the necessary drafting equipment and materials prepare street layouts to accepted industry standards.

ENABLING OBJECTIVES:

1. Identify parts of a street layout.
2. Identify symbols and notations used on street layouts.
3. Define terms associated with street layout.
4. Describe the procedure for drawing a street layout.
5. Write a land description.
6. Prepare street layout drawings.

CURRICULUM GUIDE FOR

DRAFTING AND DESIGN TECHNOLOGY

MODULE XVIII

PREPARE BASIC ELECTRICAL/ ELECTRONIC DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XVIII - PREPARE BASIC ELECTRICAL/ELECTRONIC DRAWINGS

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It is the goal of this program guide to provide a level of instruction which will impart entry level employment skills. Students should be carefully counseled on the importance of attaining competency in the tasks assigned. As in virtually all occupations today, drafting technicians will require periodic up-dating and review in the future. It is important that each student understand that meeting the program standards is essential not only to obtain employment today but also to have a base upon which to retain employment in the future.

PREPARE BASIC ELECTRICAL/ELECTRONIC DRAWINGS

18.01 TASK: Interpret Basic Electrical/Electronic Standards and Symbols

PERFORMANCE OBJECTIVE: Given ANSI or other national-level standards for electrical/electronic graphic symbols, and the necessary drafting equipment and materials, interpret basic electrical/electronic standards and symbols.

ENABLING OBJECTIVES:

1. Identify electrical/electronic diagrams.
2. Explain why long lines and crossovers should be avoided in an electrical diagram.
3. Describe procedures for sketching symbols and line conventions.
4. Explain techniques for drawing lines and symbols with templates and devices.
5. Identify line types and applications unique to electrical/electronic drafting.
6. Interpret ANSI or other applicable standards for electrical/electronic symbols and conventions.

18.02 TASK: Prepare Schematic Drawings

PERFORMANCE OBJECTIVE: Given a block or single-line diagram of an electrical circuit, control, or system, written information, ANSI or other national-level standard, necessary drafting equipment and materials, prepare schematic drawings including a bill of materials. The drawings and bill of materials must meet appropriate industry standards.

ENABLING OBJECTIVES:

1. Explain differences between single-line diagrams and schematics.
2. Explain why long lines, interconnecting leads, and unnecessary turns or bends should be avoided.
3. Describe the procedure for drawing a schematic diagram.
4. Identify the correct methods for labeling symbols, routing lines, and indicating components that are in series or parallel.
5. Reference ANSI or other applicable standards regarding electrical/electronic schematic diagrams.
6. Prepare schematic drawings.

18.03 TASK: Prepare Cable Drawings

PERFORMANCE OBJECTIVE: Given block, single-line or schematic diagrams of an electrical circuit, control, or system, ANSI or other national-level standards, and the necessary drafting equipment and materials, prepare cabling drawings. The drawings must meet appropriate industry standards.

ENABLING OBJECTIVES:

1. Define the term cable drawing.
2. List the steps in preparing a cable drawing used to optimize wiring operations.

3. Identify graphic symbols used in cable drawings.
4. Describe the tabular form of wire identification and routing.
5. Prepare cable drawings.

18.04 TASK: Prepare Component Drawings

PERFORMANCE OBJECTIVE: Given electrical/electronic symbols, schematic drawings, design layout, component size features, circuit art work, and silk screen art work, prepare component drawings. The drawings must meet appropriate industry standards.

ENABLING OBJECTIVES:
1. List all drawings necessary to prepare a component drawing.
2. Use schematic and logic diagrams to identify electronic components.
3. Draw component feature symbols using a template.
4. Prepare component drawings.

18.05 TASK: Prepare Logic Diagrams

PERFORMANCE OBJECTIVE: Given symbols for logic gate diagrams, specifications of various integrated circuit packages, binary code principles, truth table definitions, prepare logic diagrams. The drawings must meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Identify the major logic symbols.
2. Explain the binary numbering system and how it works.
3. Calculate all possible solutions for the truth tables of the basic logic symbols.
4. Calculate the output for a given logic diagram.
5. Prepare logic diagrams.

18.06 TASK: Prepare Control Panel Drawings

PERFORMANCE OBJECTIVE: Given a block, single-line, or schematic diagram and written information for a control panel enclosure, and necessary drafting materials, prepare industrial control panel drawings. The drawings must meet appropriate industry standards.

ENABLING OBJECTIVES:
1. Explain the purpose of control drawings.
2. Describe control panel drawings to include a sequence of operations list and bill of materials.
3. Identify components of a bill of materials.
4. Explain how control panel drawings can be used to indicate controls for industrial machinery.
5. Prepare control panel drawings.

CURRICULUM GUIDE FOR

DRAFTING AND DESIGN TECHNOLOGY

MODULE XIX

PREPARE BASIC PNEUMATIC/ HYDRAULIC DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XIX - PREPARE BASIC PNEUMATIC/HYDRAULIC DRAWINGS

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PREPARE BASIC PNEUMATIC/HYDRAULIC DRAWINGS

19.01 TASK: Prepare Basic Pneumatic/Hydraulic Drawings

PERFORMANCE OBJECTIVE: Given a pneumatic/hydraulic drawing and the necessary materials, prepare pneumatic/hydraulic drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. Identify symbols, standards, and formats used in pneumatic/hydraulic drawings.
2. List special instruments and equipment needed for pneumatic/hydraulic drawings.
3. Identify abbreviations used on drawing.
4. Evaluate drawings for accuracy, appearance, and format.
5. Prepare basic pneumatic/hydraulic drawings.

19.02 TASK: Prepare Piping Drawing

PERFORMANCE OBJECTIVE: Given a piping layouts, specifications and the necessary equipment and materials, prepare piping drawings to acceptable industry standards.

ENABLING OBJECTIVES:
1. Identify the types of piping drawings.
2. Identify types of job fittings, flanges, valves, and gaskets used on piping drawings.
3. Defined terms used in piping drafting.
4. Describe the procedure for preparing a piping drawing.
5. Prepare piping drawings.

19.03 TASK: Prepare Isometric Drawings

PERFORMANCE OBJECTIVE: Given an isometric layout of a pneumatic/hydraulic drawing, specifications, standards, and the necessary equipment and materials, prepare isometric drawings to acceptable industry standards.

ENABLING OBJECTIVES:
1. Explain the purpose of isometric drawings.
2. Identify the types of pneumatic/hydraulic drawings.
3. Identify the symbols and layouts of pneumatic/hydraulic isometric drawings.
4. Describe the procedure for drawing a pneumatic/hydraulic isometric drawing.
5. Prepare pneumatic/hydraulic isometric drawings.

19.04 TASK: Prepare Sectional Diagrams

PERFORMANCE OBJECTIVE: Given a pneumatic/hydraulic drawing with sectioning required, specifications and the necessary equipment and materials, prepare sectional diagrams to acceptable industry standards.

ENABLING OBJECTIVES:
1. Explain the purpose of a sectional diagram.
2. Identify the types of sectional diagrams.

3. Interpret drawings to determine the type of sectional diagrams required.
4. Describe the procedure for drawing a sectional diagram.
5. Prepare pneumatic/hydraulic sectional diagrams.

19.05 TASK: Prepare Graphic Symbols

PERFORMANCE OBJECTIVE: Given a graphic diagram layout, specifications, and the necessary equipment and materials, prepare graphical diagrams to acceptable industry standards.

ENABLING OBJECTIVES:

1. Identify graphical symbols.
2. Describe the use and function of each graphical symbol.
3. Describe the procedure for applying graphical symbols into the flow paths of the graphical diagram.
4. Describe how graphical symbols are used in combination with other pneumatic/hydraulic drawings.
5. Prepare graphical diagrams or combination diagrams using graphical symbols.

19.06 TASK: Prepare Process and Instrumentation Diagrams

PERFORMANCE OBJECTIVE: Given a set of parameters and the necessary drafting equipment and supplies, prepare process and instrumentation diagrams to acceptable industry standards.

ENABLING OBJECTIVES:

1. Describe the components of a process and instrumentation drawing.
2. Explain the purpose of a process and instrumentation drawing.
3. Sketch in graphic format the components of a process and instrumentation drawing.
4. Prepare process and instrumentation diagrams.

09.07 TASK: Prepare Combination Diagrams

PERFORMANCE OBJECTIVES: Given a set of parameters and the necessary drafting equipment and supplies, prepare combination diagrams. The drawings must depict components in a pictorial and cutaway format and illustrate a complete hydraulic, or pneumatic circuit. The drawings will conform to acceptable industry standards.

ENABLING OBJECTIVES:

1. Define the components of a combination diagram.
2. Explain the purpose of a combination diagram.
3. Sketch the components of a combination diagram.
4. Distinguish between pictorial, and cutaway formats.
5. Prepare hydraulic and pneumatic circuit diagrams using a combination of pictorial, and cutaway components.

19.08 TASK: Prepare Pump and Motor Drawings

PERFORMANCE OBJECTIVES: Given a set of parameters and the necessary drafting equipment and supplies prepare pump and motor drawings. The drawings will show all necessary information in graphic, pictorial, or cutaway format and will conform to acceptable industry standards.

ENABLING OBJECTIVES:

1. Define the various types of pumps and motors.
2. Describe the purpose of the various types of pumps and motors.
3. Sketch pumps and motors in graphic, pictorial, and cutaway format.
4. Prepare drawings of pumps and motors in graphic, pictorial, and cutaway format.

19.09 TASK: Prepare Cylinder and Piston Diagrams

PERFORMANCE OBJECTIVES: Given a set of parameters and the necessary drafting equipment and supplies, prepare cylinder and piston diagrams to acceptable industry standards.

ENABLING OBJECTIVES:

1. Define the components of a hydraulic lifting system.
2. Discuss the theory of a hydraulic lifting system.
3. Sketch a hydraulic lifting system.
4. Calculate the forces involved in a lifting system.
5. Prepare drawings showing cylinder and piston diagrams.

19.10 TASK: Prepare Valve Drawings

PERFORMANCE OBJECTIVES: Given a set of parameters and the necessary drafting equipment and supplies, prepare valve drawings to acceptable industry standards.

ENABLING OBJECTIVES:

1. List the types of valves.
2. Discuss the function of the types of valves.
3. Sketch valves in graphic, pictorial, and cutaway formats.
4. Prepare drawings of valves using graphic, pictorial, and cutaway formats.

19.11 TASK: Prepare Pump Section Drawings

PERFORMANCE OBJECTIVES: Given a set of parameters and the necessary drafting equipment and supplies, prepare pump section drawings to acceptable industry standards.

ENABLING OBJECTIVES:

1. List types of pumps.
2. Compare types of pumps.
3. Sketch pumps in section.
4. Prepare section drawings of pumps.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE XX

PREPARE BASIC MECHANICAL DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XX - PREPARE BASIC MECHANICAL DRAWINGS

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PREPARE BASIC MECHANICAL DRAWINGS

20.01 TASK: Interpret Basic Mechanical Standards and Symbols

PERFORMANCE OBJECTIVE: Given a basic working drawing or pictorial drawing, and the necessary materials, interpret the basic mechanical standards and symbols.

ENABLING OBJECTIVES:

1. Identify the machining and engineering specifications.
2. List the precision layout instruments and drafting equipment.
3. List the alphabet of lines and line thickness of each.
4. Identify geometric shapes and symbols.
5. Identify abbreviations used on drawings.
6. Distinguish between machined and un-machined surfaces.
7. Interpret ANSI and industry standards.
8. Explain why clarity, speed, and accuracy are important considerations in commercial drafting.
9. Evaluate drawing accuracy.

20.02 TASK: Prepare Detail Drawings

PERFORMANCE OBJECTIVE: Given freehand sketches and specifications for a machined part, precision layout instruments, industry standards, and the necessary drafting equipment and materials, prepare detail drawings. The drawing must meet accepted industry standards.

ENABLING OBJECTIVES:

1. Explain what is included in a full graphic representation.
2. Identify explanatory notes and dimensioning information included on machine detail drawings.
3. Describe the procedure for constructing detail drawings.
4. Distinguish between a detail drawing and an assembly drawing.
5. Explain referencing procedures for detail drawings.
6. Prepare detail drawings.

20.03 TASK: Prepare Weldment Drawings

PERFORMANCE OBJECTIVE: Given pictorial and orthographic views, specifications, and dimensions, American Welding Society Standards for weldment drawings, and the necessary drafting equipment and materials, prepare weldment drawings. The finish drawings must meet accepted industry standards.

ENABLING OBJECTIVES:

1. Identify basic welding joints and symbols.
2. Describe testing techniques.
3. Identify basic welding terms.

4. Interpret welding specifications and references used for symbols.
5. Describe the procedure for constructing weldment drawings.
6. Reference American Welding Society Standard for weldment drawings.
7. Prepare weldment drawings.

20.04 TASK: Prepare Detailed Bearing Drawings

PERFORMANCE OBJECTIVE: Given a bearing, engineering specifications, industry standards, precision layout instruments, and the necessary drafting equipment and materials, prepare detailed drawings. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:
1. Identify different kinds of bearings.
2. Explain how a bearing is loaded.
3. Explain why it is necessary to design a shaft and hub for a bearing.
4. Describe the procedure for detailing a shaft and hub for a bearing.
5. Identify references for selection of bearings.
6. Prepare detailed bearing drawings.

20.05 TASK: Prepare Casting Drawings

PERFORMANCE OBJECTIVE: Given castings or freehand sketches, machining specifications, precision layout instruments, industry standards, and the necessary drafting equipment and materials, prepare casting drawings. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:
1. Describe manufacturing methods for casting.
2. Identify castings by use and materials.
3. Explain the purpose of casting drawings.
4. Describe the procedure for developing casting drawings.
5. Identify the different kinds of castings.
6. Prepare casting drawings.

20.06 TASK: Prepare Forging Drawings

PERFORMANCE OBJECTIVE: Given forgings or freehand sketches, machining specifications, precision layout instruments, industry standards, and the necessary drafting equipment and materials, prepare forging drawings. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:
1. Describe manufacturing methods for forging.
2. Identify castings by use and materials.

3. Explain the purpose of forging drawings.
4. Describe the procedure for developing forging drawings.
5. Identify the different kinds of forgings.
6. Prepare forging drawings.

20.07 TASK: Prepare Tool Drawings

PERFORMANCE OBJECTIVE: Given a production piece, jig, fixture, or freehand sketches, jig and fixture specifications, industry standards, precision layout instruments, and the necessary drafting equipment and materials, draw tool drawings. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:

1. Explain the uses of jigs and fixtures in manufacturing.
2. Explain why jigs and fixtures must include the production piece to be manufactured.
3. Describe the procedure for constructing tool drawings.
4. Explain why clamping techniques must be considered in jigs and fixtures.
5. Explain the difference between a jig and a fixture.
6. Prepare tool drawings.

20.08 TASK: Prepare Molding Drawings

PERFORMANCE OBJECTIVE: Given a molding or freehand sketches, machining specifications, precision layout instruments, and the necessary drafting equipment and materials, prepare molding drawings. The drawing must meet accepted industry standards.

ENABLING OBJECTIVES:

1. Describe a molding drawing.
2. Define molding terms.
3. Name the families of plastics.
4. Explain where plastics are best used.
5. Observe methods of fabricating plastics.
6. Compare procedures for making molding drawings.
7. Prepare molding drawings.

20.09 TASK: Prepare Drawings With Special Processed Holes

PERFORMANCE OBJECTIVES: Given a working drawing or sketches, precision layout instruments, specifications, and the necessary drafting equipment and materials, prepare a drawing given different kinds of special processed holes. The drawing must meet accepted industry standards.

ENABLING OBJECTIVES:

1. List the different kinds of special processed holes.
2. Describe methods of representing the most common types of machined holes.
3. List the order of specific when labeling a special processed hole.
4. Describe the proper procedure for lettering and dimensioning special processed holes.
5. Describe methods the machinist uses for making any of the special processed holes.
6. Prepare drawing with special processed holes.

20.10 TASK: Prepare Stamping Drawings

PERFORMANCE OBJECTIVE: Given a stamping or free hand sketches, precision layout instruments, and the necessary drafting equipment and materials, prepare stamping drawings. The drawing must meet accepted industry standards.

ENABLING OBJECTIVES:

1. Describe stamping drawings.
2. Describe the operation of a stamping machine.
3. Describe the procedure for developing stamping drawings.
4. Explain the importance of stamping processes.
5. Define terms related to stamping.
6. Prepare stamping drawings.

20.11 TASK: Prepare Numerical Control Drawings

PERFORMANCE OBJECTIVE: Given a machine part or free hand sketches, precision layout instruments, and the necessary drafting equipment and materials, prepare numerical control drawings. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:

1. Describe numerical control processes.
2. List advantages of numerical control machinery.
3. Identify numerical machines with the correct process (automation and transfer).
4. Describe the procedure for developing numerical control drawings.
5. Define terms related to numerical control.
6. Describe computer interfacing procedures.
7. Compare the procedures for developing drawings for CAD/CAM and traditional machining processes.
8. Prepare numerical control drawings.

20.12 TASK: Prepare Assembly Drawings

PERFORMANCE OBJECTIVE: Given a multiple part assembly or freehand sketches, specifications, reference materials, precision layout instruments, industry standards, and the necessary drafting equipment and materials, prepare an orthographic or isometric assembly/subassembly drawing. The finished drawing must meet acceptable industry standards.

ENABLING OBJECTIVES:

1. **Define assembly and subassembly drawings.**
2. **Explain the difference between orthographic and isometric assembly drawings.**
3. **Describe the uses of orthographic or isometric assembly/subassembly drawings.**
4. **Describe the procedure for constructing orthographic or isometric assembly and subassembly drawings.**
5. **Prepare a bill of materials of assembly/subassembly drawings.**
6. **Describe components, purposes, procedures, and special rules regarding a bill of materials.**
7. **Prepare assembly drawings.**

CURRICULUM GUIDE FOR

DRAFTING AND DESIGN TECHNOLOGY

MODULE XXI

PREPARE ADVANCED ELECTRICAL/ ELECTRONIC DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XXI - PREPARE ADVANCED ELECTRICAL/ELECTRONIC DRAWINGS

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PREPARE ADVANCED ELECTRICAL/ELECTRONIC DRAWINGS

21.01 TASK: Prepare Connection Drawings

PERFORMANCE OBJECTIVE: Given free hand sketches or a series of electronic drawings, industry standards, the necessary drafting equipment, and materials, prepare connection drawings. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:

1. **Define an electronic connection.**
2. **Describe the difference between connections and interconnections.**
3. **Identify electrical/electronic symbols with reference to industry standards.**
4. **Interpret a simplified wire diagram.**
5. **Describe the procedure for developing connection drawings.**
6. **Prepare connection drawings.**

21.02 TASK: Prepare Interconnection Drawings

PERFORMANCE OBJECTIVE: Given freehand sketches or a series of connection drawings, industry standards, the necessary drafting equipment and materials, prepare interconnection drawings. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:

1. **Define an electronic interconnection.**
2. **Describe the difference between interconnections with reference to industry standards.**
3. **Identify electronic symbols and interconnections.**
4. **Describe various electronic interconnector types.**
5. **Explain how to take two or more component parts and interconnect them to one another.**
6. **Describe the procedure for developing interconnection drawings.**
7. **Prepare interconnection drawings.**

21.03 TASK: Prepare Printed Circuit Board Drawings

PERFORMANCE OBJECTIVE: Given freehand sketches, industry standards, the necessary drafting equipment and materials, prepare printed circuit board drawings. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:

1. **Define terms related to printed circuit boards.**
2. **Describe the components of a PCB.**
3. **Identify grid types and spacing for appropriate application.**
4. **Identify materials used in PCB construction.**
5. **Identify tape and trace widths.**
6. **Identify ground/power plane configurations.**

7. Identify board types, layout, layout clearances, and special notes used in PCB construction.
8. Describe the difference between single and double sided PCB.
9. Describe PCB fabrication procedures.
10. Prepare printed circuit board drawings.

21.04 TASK: Prepare Harness Drawings

PERFORMANCE OBJECTIVE: Given harness or freehand sketches, industry standards, the necessary drafting equipment and materials, prepare harness drawings. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:
1. Describe the purpose of a harness.
2. List the components of a harness.
3. Define terms associated with harnesses.
4. List items in a harness assembly drawing.
5. Describe the procedure for developing a harness drawing.
6. Identify color codes or labels on wires.
7. Prepare harness drawings.

21.05 TASK: Prepare Package Drawings

PERFORMANCE OBJECTIVE: Given freehand sketches or electronic drawings, the necessary drafting equipment and materials, prepare package drawings to include a bill of materials. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:
1. Identify the content of package drawings.
2. Explain general and specific notes for package (assembly) drawings.
3. Identify mounting hardware.
4. Describe types of tests on PCB's for quality control.
5. List information found in a bill of materials.
6. Define terms related to a production package drawing.
7. Describe the procedure for developing package drawings.
8. Prepare package drawings.

21.06 TASK: Describe Operation of Electromechanical Components

PERFORMANCE OBJECTIVE: Given instruction and resources, the student will describe the use, operation, appearance and symbology of electromechanical components.

ENABLING OBJECTIVES:
1. List electrical components.
2. Describe the application of the components.
3. Identify the components by actual appearance and symbology.

21.07 TASK: Prepare Motor Control Drawings

PERFORMANCE OBJECTIVE: Given freehand sketches, industry standards, necessary drafting equipment and materials, prepare motor control drawings. The drawings must meet accepted industry standards.

ENABLING OBJECTIVES:

1. Define terms related to motor control.
2. Compare control circuits and power (line voltage) circuits.
3. Identify components involved in motor control.
4. Discuss motor protection.
5. Discuss code requirements for motor control panels and placement.
6. Describe symbology of line width in motor control drawings.
7. Prepare motor control drawings.

CURRICULUM GUIDE FOR

DRAFTING AND DESIGN TECHNOLOGY

MODULE XXII

PREPARE ADVANCED COMPUTER AIDED DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XXII - PREPARE ADVANCED COMPUTER AIDED DRAWINGS

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It is the goal of this program guide to provide a level of instruction which will impart entry level employment skills. Students should be carefully counseled on the importance of attaining competency in the tasks assigned. As in virtually all occupations today, drafting technicians will require periodic up-dating and review in the future. It is important that each student understand that meeting the program standards is essential not only to obtain employment today but also to have a base upon which to retain employment in the future.

PREPARE ADVANCED COMPUTER AIDED DRAWINGS

22.01 TASK: Operate Work Terminal

PERFORMANCE OBJECTIVE: Given a CAD work terminal and reference materials, operate the work terminal to prepare a drawing.

ENABLING OBJECTIVES:
1. List the steps to start-up and exit the work terminal.
2. List specific care and maintenance procedures for the upkeep of the work terminal.
3. Describe the procedure to load and run a drafting program on the work terminal.
4. Diagram the flow of information from input to output (hard copy) through each component of the work terminal.
5. Demonstrate use of input and output devices.
6. Prepare a drawing using the work terminal.

22.02 TASK: Utilize System Commands

PERFORMANCE OBJECTIVE: Given a computer aided drawing system, user manuals, and general reference materials, set-up a drawing and produce a hard copy of a given drawing by utilizing the system commands.

ENABLING OBJECTIVES:
1. Match the correct system commands with the corresponding system functions.
2. Demonstrate the ability to utilize the system commands.
3. Generate a drawing.
4. Update and save files.

22.03 TASK: Perform Drafting Procedures

PERFORMANCE OBJECTIVE: Given a computer aided drawing system, user manual and general reference materials, prepare a drawing to accepted industry standards.

ENABLING OBJECTIVES:
1. List the procedures for drawing setup.
2. Define terms associated with drawing setup.
3. Prepare the system for a drawing.
4. Generate a drawing.
5. Utilize accepted save and backup procedures.
6. Prepare a working drawing.

22.04 TASK: Operate Peripheral Equipment

PERFORMANCE OBJECTIVE: Given computer aided drawing peripheral equipment, user manuals, and general reference manuals, operate the peripheral equipment.

ENABLING OBJECTIVES:
1. List the peripheral equipment.
2. Identify peripheral equipment.
3. Define the terms associated peripheral equipment.
4. Operate peripheral equipment.

22.05 TASK: Apply Specialized CAD Functions

PERFORMANCE OBJECTIVE: Given a CAD station, operating system manuals, and specifications for drafting commands, prepare a drawing with specialized CAD functions to accepted industry standards.

ENABLING OBJECTIVES:
1. List specialized CAD functions.
2. Identify specialized CAD functions.
3. Define terms associated with specialized CAD functions.
4. Describe the procedures for system customization.
5. Apply third party software.
6. Prepare a drawing using specialized CAD functions.

22.06 TASK: Produce Architectural Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce architectural drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of architectural drawings.
2. Define terms associated with architectural drawings.
3. Describe the procedures used to generate architectural drawings.
4. Prepare a set of architectural drawings.

22.07 TASK: Produce Structural Steel and Reinforcing Detail Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce structural steel and reinforcing detail drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of structural steel and reinforcing detail drawings
2. Define terms associated with structural steel and reinforcing detail drawings.

3. Describe the procedures used to generate structural steel and reinforcing detail drawings.
4. Prepare a set of structural steel and reinforcing detail drawings.

22.08 TASK: Produce Map Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce map drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of map drawings.
2. Define terms associated with map drawings.
3. Describe the procedures used to generate map drawings.
4. Prepare a set of map drawings.

22.09 TASK: Produce Civil Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce civil drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of civil drawings.
2. Define terms associated with civil drawings.
3. Describe the procedures used to generate civil drawings.
4. Prepare a set of civil drawings.

22.10 TASK: Produce Electrical/Electronic Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce Electrical/Electronic drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of electrical/electronic drawings.
2. Define terms associated with electrical/electronic drawings.
3. Describe the procedures used to generate electrical/electronic drawings.
4. Prepare a set of electrical/electronic drawings.

22.11 TASK: Produce Pneumatic/Hydraulic Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce pneumatic/hydraulic drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of pneumatic/hydraulic drawings.
2. Define terms associated with pneumatic/hydraulic drawings.

3. Describe the procedures used to generate pneumatic/hydraulic drawings.
4. Prepare a set of pneumatic/hydraulic drawings.

22.12 TASK: Produce Pattern Shop Detail Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce pattern shop detail drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of pattern shop detail drawings.
2. Define terms associated with pattern shop detail drawings.
3. Describe the procedures used to generate pattern shop detail drawings.
4. Prepare a set of pattern shop detail drawings.

22.13 TASK: Produce Casting Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce casting drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of casting drawings.
2. Define terms associated with casting drawings.
3. Describe the procedures used to generate casting drawings.
4. Prepare a set of casting drawings.

22.14 TASK: Produce Forging Detail Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce forging detail drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of forging detail drawings.
2. Define terms associated with forging detail drawings.
3. Describe the procedures used to generate forging detail drawings.
4. Prepare a set of forging detail drawings.

22.15 TASK: Produce Machine Detail Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce machine detail drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of machine detail drawings.

2. Define terms associated with machine detail drawings.
3. Describe the procedures used to generate machine detail drawings.
4. Prepare a set of machine detail drawings.

22.16 TASK: Produce Stamping Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce stamping drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of stamping drawings.
2. Define terms associated with stamping drawings.
3. Describe the procedures used to generate stamping drawings.
4. Prepare a set of stamping drawings.

22.17 TASK: Produce Weldment Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce weldment drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of weldment drawings.
2. Define terms associated with weldment drawings.
3. Describe the procedures used to generate weldment drawings.
4. Prepare a set of weldment drawings.

22.18 TASK: Produce Assembly Drawing

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce assembly drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of assembly drawings.
2. Define terms associated with assembly drawings.
3. Describe the procedures used to generate assembly drawings.
4. Prepare a set of assembly drawings.

22.19 TASK: Produce Installation Drawings

PERFORMANCE OBJECTIVE: Given a CAD system, specifications, reference materials, and supplies, produce installation drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List components of a set of installation drawings.
2. Define terms associated with installation drawings.
3. Describe the procedures used to generate installation drawings.
4. Prepare a set of installation drawings.

CURRICULUM GUIDE FOR DRAFTING AND DESIGN TECHNOLOGY

MODULE XXIII

PREPARE ADVANCED MECHANICAL DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XXIII - PREPARE ADVANCED MECHANICAL DRAWINGS

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PREPARE ADVANCED MECHANICAL DRAWINGS

23.01 TASK: Identify the Various Manufacturing Methods

PERFORMANCE OBJECTIVE: Given a set of parameters and finished drawings, determine proper manufacturing methods used to produce parts depicted on the drawings.

ENABLING OBJECTIVES:
1. List manufacturing processes.
2. Describe manufacturing processes.
3. Interpret surface finishing symbols.
4. Evaluate drawings for appropriate manufacturing processes.

23.02 TASK: Solve Problems by Descriptive Geometry and Revolutions

PERFORMANCE OBJECTIVE: Given a set of parameters, the necessary drafting equipment and supplies, solve problems using descriptive geometry and revolutions.

ENABLING OBJECTIVES:

1. Define terms associated with descriptive geometry and revolutions.
2. Describe the procedure for resolving descriptive geometry and revolution problems.
3. Sketch preliminary solutions to problems.
4. Solve problems using descriptive geometry and revolutions.
5. Evaluate finished solutions for accuracy.

23.03 TASK: Prepare Advanced Surface Drawings

PERFORMANCE OBJECTIVE: Given a set of parameters the necessary drafting equipment and supplies, prepare surface drawings to accepted industry standards.

ENABLING OBJECTIVES:
1. List the steps to prepare surface drawings.
2. Define terms associated with surface drawings.
3. Describe the procedures to prepare surface drawings.
4. Evaluate surface drawings for accuracy.
5. Prepare surface drawings.

23.04 TASK: Use Precision Dimensioning Including Geometric Characters

PERFORMANCE OBJECTIVE: Given a set of parameters, reference materials, and the necessary drafting equipment and supplies, prepare drawings depicting dimensions with precision tolerancing to accepted industry standards.

ENABLING OBJECTIVES:
1. List geometric characters and symbols.

2. Define geometric characters and symbols.
3. Describe bilateral and unilateral tolerancing.
4. Apply bilateral and unilateral tolerancing to drawings.
5. Prepare drawings using precision dimensioning
6. Evaluate finished drawings for accuracy.

23.05 TASK: Use Precision Measuring Instruments

PERFORMANCE OBJECTIVE: Given precision measuring instruments, reference materials, and machined parts, determine the size and location of features of parts.

ENABLING OBJECTIVES:

1. List the precision measuring tools.
2. Describe the use of precision measuring tools.
3. Sketch views of measured parts.
4. Evaluate sketches of measured parts for accuracy.

23.06 TASK: Make Recommended Changes on Drawings

PERFORMANCE OBJECTIVE: Given a finished drawing, reference materials, and an accompanying engineering change order, make the specified changes on the drawing to accepted industry standards.

ENABLING OBJECTIVES:

1. Discuss the procedure for making engineering changes.
2. Revise drawings following engineering change orders.
3. Evaluate changes made to drawings from engineering change orders for accuracy.

23.07 TASK: Prepare Fastener Drawings

PERFORMANCE OBJECTIVE: Given a set of parameters, reference materials, and the necessary drafting equipment and supplies, prepare drawings of fasteners to accepted industry standards.

ENABLING OBJECTIVES:

1. List common fasteners.
2. Describe the use of common fasteners.
3. Prepare fastener drawings.
4. Evaluate drawings of fasteners for accuracy.

23.08 TASK: Prepare Cam Drawings

PERFORMANCE OBJECTIVE: Given a set of parameters, reference materials, and the necessary drafting equipment and supplies, prepare drawings of cams to accepted industry standards.

ENABLING OBJECTIVES:

1. List cam types.

2. List cam follower types.
3. Describe categories of follower motion.
4. Construct displacement diagrams.
5. Prepare cam drawings.
6. Evaluate finished drawings for accuracy.

23.09 TASK: Prepare Gear Drawings

PERFORMANCE OBJECTIVE: Given a set of parameters, reference materials, and the necessary drafting equipment and supplies, prepare detailed drawings of gears to accepted industry standards.

ENABLING OBJECTIVES:

1. Define terms associated with gear drawings.
2. Calculate the cutting data for gears.
3. Prepare gear drawings.
4. Evaluate finished drawings of gears for accuracy.

23.10 TASK: Prepare Spring Drawings

PERFORMANCE OBJECTIVE: Given a set of parameters, reference materials, and the necessary drafting equipment and supplies, prepare detailed and schematic spring drawings to accepted industry standards.

ENABLING OBJECTIVES:

1. List spring types.
2. Describe spring types.
3. Define terms associated with springs drawings.
4. Discuss spring specifications.
5. Prepare detailed drawings of springs.
6. Prepare schematic drawings of springs.
7. Evaluate finished drawings of springs for accuracy.

23.11 TASK: Prepare Pneumatic/Hydraulic Drawings

PERFORMANCE OBJECTIVE: Given a set of parameters, reference materials, and the necessary drafting equipment and supplies, prepare pneumatic and hydraulic drawings to accepted industry standards.

ENABLING OBJECTIVES:

1. Define the components of a pneumatic and/or hydraulic system.
2. Discuss the purpose of a graphic diagram.
3. Sketch diagrams of circuits.
4. Prepare pneumatic/hydraulic drawings.
5. Evaluate finished pneumatic/hydraulic drawings for accuracy.

23.12 TASK: Prepare Pulley and Chain Drive Drawings

PERFORMANCE OBJECTIVE: Given a set of parameters and the necessary drafting equipment and supplies, prepare detailed and assembly drawings of pulley and chain drive systems to accepted industry standards.

ENABLING OBJECTIVES:
1. Identify the components of pulley chain drive assemblies.
2. Calculate ratios for pulley and chain drives.
3. Explain how to calculate chain loads.
4. Describe the procedure for drawing pulley and chain drive components.
5. Prepare pulley and chain drive drawings.
6. Evaluate finished drawings of pulleys and chain drives for accuracy.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE XXIV

PREPARE TOOL AND DIE DRAWINGS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XXIV - PREPARE TOOL AND DIE DRAWINGS

This is one of a series of modules which comprise the Idaho Curriculum Guide for Drafting Technology. Each module contains a listing of the tasks, performance objectives, and enabling objectives required to enable a student to achieve competency in a specific system or field of study within the basic drafting technician occupational field. The numbering of these modules is not intended to dictate an order of instruction or scheduling. The order in which these modules may be taught is determined by each institution and its instructors.

Each task describes an occupational activity which will result in a finished process or product. The tasks listed in each module represent the basic activities required of each student to demonstrate entry level competence for that specific system or field of study within the drafting occupation. Individual records of student performance in completing the tasks listed within each module should be maintained.

Although some provision is made for basic mathematics and communication skills within this guide, they may not be adequate to meet the needs of individual students. Counseling, guidance, and diagnostic test results may indicate a need for further preparation in these areas. In such cases, instructors are encouraged to utilize the resources and personnel within the institution to improve or complement the instructional process.

The benefits to students and institutions derived from this curriculum guide should be considerable. Articulation of students from secondary to post-secondary programs will be aided through the use of a single curriculum guide. The guide provides a tool for evaluation of local curriculum and programs. The guide may be used in a flexible manner to assure that drafting programs meet the needs of local business and industry.

It is the goal of this program guide to provide a level of instruction which will impart entry level employment skills. Students should be carefully counseled on the importance of attaining competency in the tasks assigned. As in virtually all occupations today, drafting technicians will require periodic up-dating and review in the future. It is important that each student understand that meeting the program standards is essential not only to obtain employment today but also to have a base upon which to retain employment in the future.

PREPARE TOOL AND DIE DRAWINGS

24.01 TASK: Draw Jigs and Fixtures

PERFORMANCE OBJECTIVE: Given freehand sketches of jigs and fixtures, specifications, precision layout instruments, and the necessary drafting equipment and materials, draw jigs and fixtures to industry standard format.

ENABLING OBJECTIVES:

1. Describe the use of jigs and fixtures in manufacturing.
2. Explain why a jig drawing must include the production piece to be manufactured.
3. Explain why a fixture drawing must include the production piece.
4. Describe the procedure for constructing a jig drawing.
5. Describe the procedure for drawing a fixture.
6. Explain why clamping techniques must be considered in a jig drawing.
7. Identify applications of fixtures in the machine tool industry.
8. Prepare jig and fixture drawings.

24.02 TASK: Draw Cutting Dies

PERFORMANCE OBJECTIVE: Given a sketch of a product (piece part) to be manufactured, specifications, and the necessary drafting equipment, draw the necessary cutting dies to industry standard format.

ENABLING OBJECTIVES:

1. Define a die set.
2. Explain the purpose of a blinding die.
3. Explain the purpose of a punching die.
4. Explain the function of stripping.
5. Determine the cutting clearance.
6. Explain the purpose of die stops.
7. Explain the purpose of guide strip pins.
8. Explain the purpose of nest gauges.
9. Determine the necessary angular clearance.
10. Determine the cutting land thickness.
11. Explain why a cutting die drawing should include the production piece.
12. Prepare cutting die drawings.

24.03 TASK: Draw Forming Dies

PERFORMANCE OBJECTIVE: Given a sketch of product (piece part) to be manufactured, specifications, and the necessary drafting equipment, draw cutting dies to industry standard format.

ENABLING OBJECTIVES:

1. Define terms associated with forming dies.
2. Describe the procedure for preparing forming die drawings.
3. Prepare forming die drawings.

CURRICULUM GUIDE FOR
DRAFTING AND DESIGN TECHNOLOGY

MODULE XXV

APPLY BASIC SURVEYING SKILLS

Division of Vocational Education
State of Idaho
Boise, Idaho
1992

MODULE XXV - APPLY BASIC SURVEYING SKILLS

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It is the goal of this program guide to provide a level of instruction which will impart entry level employment skills. Students should be carefully counseled on the importance of attaining competency in the tasks assigned. As in virtually all occupations today, drafting technicians will require periodic up-dating and review in the future. It is important that each student understand that meeting the program standards is essential not only to obtain employment today but also to have a base upon which to retain employment in the future.

APPLY BASIC SURVEYING SKILLS

25.01 TASK: Describe Types of Surveys

PERFORMANCE OBJECTIVE: Given reference materials write descriptions for various types of surveys.

ENABLING OBJECTIVES:
1. Describe types of surveys
2. Define terms associated with surveying
3. Interpret legal descriptions

25.02 TASK: Apply Surveying Measurements

PERFORMANCE OBJECTIVE: Given reference materials and measuring devices, measure a given length and make corrections as necessary.

ENABLING OBJECTIVES:
1. List measurement methods and equipment.
2. Define terms associated with measuring devices.
3. Describe measuring procedures.
4. Measure vertical and horizontal distances.
5. Evaluate for precision and accuracy.

25.03 TASK: Prepare Standard Notes

PERFORMANCE OBJECTIVE: Given reference materials, notebook, equipment, and materials, record a set of field notes.

ENABLING OBJECTIVES:
1. Explain what type of notebook should be used
2. Describe notebook entry procedures.
3. Explain the importance of accurate recording procedures.
4. Prepare field notes.

25.04 TASK: Operating Surveying Equipment

PERFORMANCE OBJECTIVE: Given reference materials and equipment, operate surveying equipment according to manufacturer's specifications.

ENABLING OBJECTIVES:
1. Identify surveying instruments.
2. Explain the principles of latitude and longitude.
3. Solve mathematical problems involving civil measurements.
4. Explain the care and maintenance of the instruments.

5. Describe the importance of notes in surveying.
6. Describe the procedure for leveling instruments.
7. Describe the purpose of benchmarks.
8. Describe the procedure for establishing new benchmarks.
9. Operate surveying equipment.

25.05 TASK: Perform Surveys

PERFORMANCE OBJECTIVES: Given reference materials and surveying equipment, perform a survey.

ENABLING OBJECTIVES:

1. Discuss traverse and closed traverse.
2. Define azimuth terms.
3. Convert azimuths or interior angles to bearings.
4. Explain the care and maintenance of surveying equipment.
5. Describe the procedure for closing a traverse using latitudes and departures.
6. Explain the importance of accurate notes.
7. Calculate acreage of identified plots of land.
8. Interpret a surveying drawing.
9. Perform surveys.
10. Write legal descriptions.